Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Soil and Water Conservation Engineering
Course Code	AENG-121[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Science at Secondary level			**Co-Requisite/s**	Agriculture at secondary level			
Course Outcomes & Bloom's Level	**CO1-** Describe the importance of soil and water conservation in natural resource management**(BL1-Remember)** **CO2-** Understand the mechanism of various processes of soil erosion**(BL2-Understand)** **CO3-** Apply appropriate soil & water conservation techniques in a various field conditions**(BL3-Apply)** **CO4-** Examine the effect of erosion problem in the soil**(BL4-Analyze)** **CO5-** Evaluate the soil loss by different empirical equations and RS & GIS technique**(BL5-Evaluate)** **CO6-** Design various soil & water conservation structures in order to control soil erosion and subsequent safe disposal of water**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG13(Climate action)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Unit-I: Surveying: Survey components, Chain survey, Cross staff survey, Calculation of area of regular and irregular fields. Levelling equipments.	Guided Learning, Filed work (Outdoor Learning) Problem based learning, Brain storming	3
Unit 2	Unit-II: Introduction to Soil and Water Conservation causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures.	Guided Learning, Filed work (Outdoor Learning) Problem based learning, Brain storming	3
Unit 3	Unit-III: Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing.	Guided Learning, Filed work (Outdoor Learning) Problem based learning, Brain storming	3
Unit 4	Unit-IV: Grassed water ways and their design. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.	Guided Learning, Filed work (Outdoor Learning) Problem based learning, Brain storming	3
Unit 5	Unit-V: Introduction to irrigation. Irrigation water measurement methods and instruments-,Weirs Orifice Flumes. Rainfall erosivity - estimation as EI30 index and kinetic energy, methods of measurement and prediction of runoff, land capability classification.	Guided Learning, Filed work (Outdoor Learning) Problem based learning, Brain storming	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	General status of soil conservation in India	Experiments	BL2-Understand	2
Practical 2	Calculation of erosion index.	Experiments	BL2-Understand	2
Practical 3	Estimation of soil loss.	Experiments	BL3-Apply	2
Practical 4	Preparation of contour maps.	Experiments	BL3-Apply	2
Practical 5	Design of grass waterways	Experiments	BL4-Analyze	2
Practical 6	Visits to watershed	Field work	BL4-Analyze	2
Practical 7	Design of contour bunds	Experiments	BL5-Evaluate	2
Practical 8	Design of graded bunds.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Das, G. (2012). Hydrology and Soil Conservation Engineering, including Watershed Management. Second edition, PHI Learning Private Limited, New Delhi - 110001 Murthy, V.V.N. (2004). Land and Water Management Engineering. Kalayani Publishers, New Delhi Michael, A.M. (2007). Irrigation Theory and Practice. Second edition. Vikas Publishing House Pvt. Ltd. Mal, B.C. (1995). Introduction to Soil and Water Conservation Engineering. Kalayani Publishers, Rajinder Nagar, Ludhiana Kanetakar, T.P. (1993). Surveying and Levelling. Pune VidyarthiGriha, Prakashan, Pune Suresh, R. (2008). Land and Water Management. Standard Publishers Distributors, Delhi.
Articles	NA
References Books	
MOOC Courses	
Videos	NA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	1	-	1	-	-	-	-	-	3	1	-
CO2	-	1	1	-	1	-	2	-	-	-	-	1	1	2	-
CO3	2	-	1	1	3	-	1	-	-	-	-	2	-	-	2
CO4	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO6	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Renewable Energy and Green Technology
Course Code	AENG-221[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Science and Maths at secondary level			**Co-Requisite/s**	Science and Maths at secondary level			
Course Outcomes & Bloom's Level	**CO1-** Describe the classification of conventional and renewable Energy sources**(BL2-Understand)** **CO2-** Understand the need of renewable energy in agricultural sector**(BL2-Understand)** **CO3-** Demonstration the biogas plants and also calculate the capacity of biogas plant**(BL3-Apply)** **CO4-** Examine the different solar energy gadgets and their uses**(BL4-Analyze)** **CO5-** Determine the production process of biofuels, biodiesel, bio-oil and biogas**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Classification of energy sources, contribution of these of sources in agricultural sector	Problem-based learning: Fieldwork and outdoor learning Guided Questioning Group discussions and Scenario planning	3
Unit 2	Familiarization with biomass utilization for biofuel production and their application	Problem-based learning: Fieldwork and outdoor learning Guided Questioning Group discussions and Scenario planning	3
Unit 3	Familiarization with types of biogas plants and gasifiers, biogas, bio-alcohol, biodiesel and bio-oil production and their utilization as bioenergy resource	Problem-based learning: Fieldwork and outdoor learning Guided Questioning Group discussions and Scenario planning	3
Unit 4	Introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater.	Problem-based learning: Fieldwork and outdoor learning Guided Questioning Group discussions and Scenario planning	3
Unit 5	Application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.	Problem-based learning: Fieldwork and outdoor learning Guided Questioning Group discussions and Scenario planning	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Familiarization with Renewable Energy Gadgets	Field work	BL2-Understand	2
Practical 2	To Study Biogas Plants	Field work	BL2-Understand	2
Practical 3	To Study Gasifier	Field work	BL3-Apply	2
Practical 4	To Study the Production Process of Biodiesel	Field work	BL3-Apply	2
Practical 5	To Study the Production Process of Bio-Fuels	Field work	BL4-Analyze	2
Practical 6	Familiarization with Different Solar Energy Gadgets	Field work	BL4-Analyze	2
Practical 7	To Study Solar Photovoltaic System	Field work	BL5-Evaluate	2
Practical 8	To Study about Solar Lighting	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	J. B. Hudson (2022). Renewable Energy and Green Technology. Z_Bio-Green
Articles	NA
References Books	Sahoo, A. K. & Nanda, S. P. (2021). Renewable Energy & Green Technology. Notion Press.
MOOC Courses	
Videos	NA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	-	-	-	-	-	-	-	-	2	1	-
CO2	-	1	2	1	-	-	1	-	-	-	1	-	-	-	-
CO3	2	-	1	-	-	-	2	-	-	-	1	1	-	3	2
CO4	-	2	1	-	-	-	-	-	-	-	1	2	-	-	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Protected Cultivation And Secondary Agriculture
Course Code	AENG-321[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Agronomy			**Co-Requisite/s**	Agronomy			
Course Outcomes & Bloom's Level	**CO1-** List out the importance of Protected cultivation and its scope in India. **(BL1-Remember)** **CO2-** Discuss various types of greenhouse structures **(BL2-Understand)** **CO3-** Apply the concept of protected cultivation in major crops of India. **(BL3-Apply)** **CO4-** Examine the basics of nursery management under protected structures. **(BL4-Analyze)** **CO5-** Evaluate the utility of different growing media and growing conditions under protected structures. **(BL5-Evaluate)** **CO6-** Create the budget and design for protected cultivation and structures. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to Protected cultivation and Secondary Agriculture Importance and scope of protected cultivation Greenhouse effects and types of greenhouses	ABL, PBL, Guided learning and Field & outdoor Learning	3
Unit 2	Planning and design of greenhouses Components of greenhouse Orientations of Greenhouse Design and size of Greenhouse Load distribution Green house materials of construction for traditional and low- cost green houses.	ABL, PBL, Guided learning and Field & outdoor Learning	3
Unit 3	Irrigation under Protected Structures . Types of irrigation . Installation of Irrigation . Fertigation	ABL, PBL, Guided learning and Field & outdoor Learning	3
Unit 4	Cooling and Heating System Active heating and components Active Cooling system and Components Cost estimation and economic analysis of Greenhouse Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.	ABL, PBL, Guided learning and Field & outdoor Learning	3
Unit 5	Drying and dehydration: Moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer), Material handling equipment; conveyer and elevators, their principle, working and selection	ABL, PBL, Guided learning and Field & outdoor Learning	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Greenhouse effects and types of greenhouses	Experiments	BL2-Understand	2
Practical 2	Greenhouse design and Concept of greenhouse orientation	Experiments	BL2-Understand	2
Practical 3	Load distribution under greenhouse design	Experiments	BL2-Understand	2
Practical 4	Greenhouse components and structures	Experiments	BL3-Apply	2
Practical 5	Visit to various Post Harvest Laboratories	Experiments	BL3-Apply	2
Practical 6	Determination of Moisture content of various grains by oven drying & infrared moisture methods.	Experiments	BL4-Analyze	2
Practical 7	Determination of Moisture content of various grains by moisture meter.	Experiments	BL4-Analyze	2
Practical 8	Field visit to seed processing plant or Storage structure	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Salone, V.M. and Sharma, A.K. (2012). Greenhouse Technology and Applications. Agrotech Publishers. New Delhi.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	1	-	-	-	-	-	-	-	3	1	-
CO2	-	2	1	-	2	-	1	-	-	-	2	-	-	3	-
CO3	2	-	2	1	2	-	1	-	-	-	1	1	-	-	2
CO4	-	1	1	-	-	-	-	-	-	-	-	2	-	-	-
CO5	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-
CO6	-	-	-	-	-	2	-	-	-	-	2	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Farming System & Sustainable Agriculture
Course Code	AGRON- 222 [T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					1	0	0	1
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Fundamentals of Agronomy			**Co-Requisite/s**	Fundamentals of Agronomy			
Course Outcomes & Bloom's Level	**CO1-** Describe the basic concepts cropping systems and sustainable agriculture **(BL1-Remember)** **CO2-** Explain the interaction between different farm enterprises **(BL2-Understand)** **CO3-** Utilize the different concepts of IFS to enhance the crop productivity in sustainable ecosystem **(BL3-Apply)** **CO4-** Investigate the sustainability of different indicators in various framing system **(BL4-Analyze)** **CO5-** Judge the sustainability of various farming system models in different agro-climatic conditions to get the optimum output of the resources in sustainable manner **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG6(Clean water and sanitation) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Farming system-scope, importance, and concept; Types and systems of farming system and factors affecting types of farming	Field work, scenario Planning, Project and Thematic teaching	3
Unit 2	Farming system components and their maintenance; Cropping system and pattern, multiple cropping system, efficient cropping system and their evaluation; Allied enterprises and their importance, tools for determining production and efficiencies in cropping and farming system.	Field work, scenario Planning, Project and Thematic teaching	3
Unit 3	Sustainable agriculture ,problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability	Field work, scenario Planning, Project and Thematic teaching	3
Unit 4	Integrated farming system, historical background, objectives and characteristics, components of IFS and its advantages, site specific development of IFS model for different agro-climatic zones.	Field work, scenario Planning, Project and Thematic teaching	3
Unit 5	: Resource use efficiency and optimization techniques, resource cycling and flow of energy in different farming system, farming system and environment; Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.	Field work, scenario Planning, Project and Thematic teaching	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	41				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Sharma, A.K. 2006. A hand book of organic farming - Agrobios (India) Jodhpur
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	2	-	1	-	-	-	-	-	3	1	-
CO2	-	1	3	2	2	2	1	-	-	-	-	-	1	2	-
CO3	2	-	3	2	2	2	2	1	-	-	1	1	-	-	2
CO4	-	1	-	3	-	-	-	1	-	-	1	-	-	1	-
CO5	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Introduction to Forestry
Course Code	AGRON-122[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Biology at secondary level			**Co-Requisite/s**	Agriculture at secondary level			
Course Outcomes & Bloom's Level	**CO1-** Describe the basic concept of forestry and important features Indian Forest Policy**(BL1-Remember)** **CO2-** Classify the Indian forest with their specific features and ecological regions**(BL2-Understand)** **CO3-** Calculate the various parameters of forest**(BL3-Apply)** **CO4-** Examine the different agroforestry systems prevalent in the country**(BL4-Analyze)** **CO5-** Determine the suitability of tree species for different regions based on soil and climatic conditions**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz	3
Unit 2	Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz	3
Unit 3	Tending operations weeding, cleaning, thinning mechanical, ordinary, crown and advance thinning	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz	3
Unit 4	diameter measurement; Non instrumental methods of height measurement shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees ;	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz	3
Unit 5	Agroforestry definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Identification of tree-species	Experiments	BL2-Understand	2
Practical 2	Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.	Experiments	BL2-Understand	2
Practical 3	Height measurement of standing trees by shadow method, single pole method and hypsometer.	Experiments	BL3-Apply	2
Practical 4	Volume measurement of logs using various formulae	Experiments	BL3-Apply	2
Practical 5	Nursery lay out, seed sowing, vegetative propagation techniques Training and pruning of fruit trees	Field work	BL4-Analyze	2
Practical 6	Forest plantations and their management	Field work	BL4-Analyze	2
Practical 7	Fertilizer application in different crops	Field work	BL4-Analyze	2
Practical 8	Visits of nearby forest based industries	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Manikandan, I.F.S.K. and Prabhu, S. (2020). Indian Forestry A Breakthrough Approach. Jain Brothers Blakeney, B. (2012). Handbook Of Forestry. Agrotech Press
Articles	NA
References Books	
MOOC Courses	
Videos	NA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	3	-	-	-	-	-	-	-	3	-	-
CO2	-	1	1	2	2	-	-	-	-	-	-	1	1	2	-
CO3	2	-	2	-	3	-	-	-	-	-	1	-	-	2	1
CO4	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Introductory Agrometeorology and Climate Change
Course Code	AGRON-223[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Science at secondary level			**Co-Requisite/s**	Agriculture at secondary level			
Course Outcomes & Bloom's Level	**CO1-** Describe the basic terminology and definitions in the field of Agro-meteorology **()** **CO2-** Understand the climatic normal, process of weather formation, relationship between weather variables and agriculture. **()** **CO3-** Apply the technics for modification of climate to minimization the losses and improve the crop yield. **()** **CO4-** Analysis the causes of extreme weather conditions and the factors responsible for climate change and global warming. **()** **CO5-** Appraise the impact of particular weather and climate on crop and livestock production. **()**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction: The three spheres of the earth; Terminology and definitions: Meteorology, Climatology, Agrometeorology, Agroclimatology climate and weather - Scope and importance of agrometeorology, Agro- climatic regions of India and Agro-climatic zones of Madhya Pradesh	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz.	3
Unit 2	Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze.	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz.	3
Unit 3	Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, energy balance of earth.	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz.	3
Unit 4	Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon, mechanism and importance in Indian agriculture; Weather hazards, drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and coldwave.	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz.	4
Unit 5	Agriculture and weather relations, modifications of crop microclimate, climatic normals for crop and livestock production; Weather forecasting, types of weather forecast and their uses; Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.	Assignment, Field visits, Poster, Class room teaching, Presentation, ABL, Quiz.	3

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Visit of Agrometeorological observatory, site selection of observatory, exposure of instruments and weather data recording.	Field work		2
Practical 2	Measurement of total, shortwave and long wave radiation, and its	Field work	BL2-Understand	2
Practical 3	Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.	Field work	BL2-Understand	2
Practical 4	Measurement of soil temperature.	Field work	BL3-Apply	2
Practical 5	Determination of vapour pressure and relative humidity.	Field work	BL4-Analyze	2
Practical 6	Determination of dew point temperature	Field work	BL4-Analyze	2
Practical 7	Measurement of atmospheric pressure and analysis of atmospheric conditions;	Field work	BL5-Evaluate	2
Practical 8	Measurement of wind speed and wind direction, preparation of windrose.	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Pandey, V. 2021. Introductory Agrometeorology and Climate Change. Daya Publishing House.
Articles	NA
References Books	
MOOC Courses	
Videos	NA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	3	-	-	-	-	-	-	-	3	1	-
CO2	-	1	1	2	2	-	-	-	-	-	-	1	1	2	-
CO3	2	-	2	-	3	-	-	-	-	-	1	-	-	-	2
CO4	-	3	-	2	-	-	-	-	-	-	-	-	-	1	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Geoinformatics and Nano-technology and Precision Farming
Course Code	AGRON-311 [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Agronomy			**Co-Requisite/s**	Ag. Engineering			
Course Outcomes & Bloom's Level	**CO1-** Describe the basics of geoinformatics and nanotechnology in relation to precision farming **(BL1-Remember)** **CO2-** Explain about the effective use of inputs result in greater crop yield with good quality without affecting the environment **(BL2-Understand)** **CO3-** Apply precision agriculture which address both economic and environmental issues that surround production agriculture today **(BL3-Apply)** **CO4-** Simplify and encourage the farmers to study of special and temporal variability of the input parameters using primary data in field level **(BL4-Analyze)** **CO5-** Judge about the consequences of applying imbalance dose of farm input like irrigation, fertilizer, insecticides and pesticides **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture	ABL, PBL, Field & Outdoor Learning and guided learning	3
Unit 2	Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies	ABL, PBL, Field & Outdoor Learning and guided learning	3
Unit 3	Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions	ABL, PBL, Field & Outdoor Learning and guided learning	3
Unit 4	Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture	ABL, PBL, Field & Outdoor Learning and guided learning	3
Unit 5	Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nanosensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.	ABL, PBL, Field & Outdoor Learning and guided learning	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-1	To study about Introduction to GIS software, spatial data creation and editing	Experiments	BL2-Understand	2
Module-2	To study about Introduction to image processing software	Experiments	BL2-Understand	2
Module-3	To study about Visual and digital interpretation of remote sensing images.	Experiments	BL3-Apply	2
Module-4	To study about Generation of spectral profiles of different objects.	Experiments	BL3-Apply	2
Module-5	To study about Supervised and unsupervised classification and acreage estimation.	Experiments	BL3-Apply	2
Module-6	To study about Soil fertility map by GIS	Experiments	BL3-Apply	2
Module-7	To study about Calculation of crop stress geospatial technique	Experiments	BL4-Analyze	2
Module-8	To study about Project related by precision farming	PBL	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Reddy, S.R. (2017). Geoinformatics and Nanotechnology for Precision Farming B.Sc. 6th Sem. Kalyani Pub., Ludhiana.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	3	-	3	-	-	-	-	-	3	-	-
CO2	-	2	2	2	3	2	3	-	-	-	-	-	1	2	-
CO3	-	-	2	2	3	2	3	-	-	-	-	-	-	2	1
CO4	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Rainfed Agriculture and Watershed Management
Course Code	AGRON-321[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Agronomy			**Co-Requisite/s**	Agronomy			
Course Outcomes & Bloom's Level	**CO1-** Study the concepts of watershed management and its effect on land, water and ecosystem resources **(BL1-Remember)** **CO2-** Understand public policies and practices of watershed planning **(BL2-Understand)** **CO3-** Apply the principles and concepts in the field to conserve water resources and improve the crop productivity in Rainfed ecosystems **(BL3-Apply)** **CO4-** Analyse the impact of watershed planning through case studies **(BL4-Analyze)** **CO5-** Assess control and mitigation techniques for watershed problem **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Rainfed agriculture: Introduction, types, History of rainfed agriculture & watershed in India. Problems and prospects of rainfed agriculture in India . Soil and climatic conditions prevalent in rainfed areas.	Cooperative Learning Strategies, Case studies, outdoor learning and project management	3
Unit 2	Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Mechanism of crop adaptation under moisture deficit condition.	Cooperative Learning Strategies, Case studies, outdoor learning and project management	3
Unit 3	Water harvesting: importance, its techniques. Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas.	Cooperative Learning Strategies, Case studies, outdoor learning and project management	3
Unit 4	Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.	Cooperative Learning Strategies, Case studies, outdoor learning and project management	3
Unit 5	Crop adaptation and mitigation to drought; Mulching and its importance, Evapo-transpiration and method of reduction it	Cooperative Learning Strategies, Case studies, outdoor learning and project management	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.	Experiments	BL2-Understand	2
Practical 2	Studies on cropping pattern of different dry land areas in the country	Experiments	BL2-Understand	2
Practical 3	Demarcation of dry land area on map of India.	Experiments	BL3-Apply	2
Practical 4	Interpretation of meteorological data	Experiments	BL3-Apply	2
Practical 5	Scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.	Experiments	BL3-Apply	2
Practical 6	Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation.	Experiments	BL4-Analyze	2
Practical 7	Studies on cultural practices viz. mulching, plant density, depth of sowing, thinning and leaf removal for mitigating moisture stress.	Experiments	BL4-Analyze	2
Practical 8	Characterization and delineation of model watershed.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	ICAR. (2017). Handbook of Agriculture. ICAR, New Delhi.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO3	-	3	3	1	1	2	1	1	2	-	1	1	-	-	2
CO4	-	3	3	1	1	-	-	1	-	-	1	1	-	1	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Principal Of Organic Farming
Course Code	AGRON-322[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Agronomy			**Co-Requisite/s**	Agronomy			
Course Outcomes & Bloom's Level	**CO1-** Describe the principles and scopes of organic farming. **(BL1-Remember)** **CO2-** Explain the concept of organic ecosystem; and organic nutrient resources and its fortification **(BL2-Understand)** **CO3-** Demonstrate the restrictions to nutrient use in organic farming. **(BL3-Apply)** **CO4-** Analyse the certification process and standards of organic farming. **(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture.	Cooperative Learning Strategies (CLS), Stimulus activities, Guided Questioning and Field trials	3
Unit 2	Organic ecosystem and their concepts; Organic nutrient resources and its fortification.	Cooperative Learning Strategies (CLS), Stimulus activities, Guided Questioning and Field trials	3
Unit 3	Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming.	Cooperative Learning Strategies (CLS), Stimulus activities, Guided Questioning and Field trials	3
Unit 4	Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP	Cooperative Learning Strategies (CLS), Stimulus activities, Guided Questioning and Field trials	3
Unit 5	Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.	Cooperative Learning Strategies (CLS), Stimulus activities, Guided Questioning and Field trials	4

<4d style="border: 1px solid black;">Field work

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Preparation of enrich compost and their quality analysis.	Experiments	BL2-Understand	2
Practical 2	Preparation of vermi-compost and their quality analysis.	Experiments	BL2-Understand	2
Practical 3	Preparation of bio-fertilizers and their quality analysis.	Experiments	BL2-Understand	2
Practical 4	Preparation of bio-inoculants and their quality analysis.	Experiments	BL2-Understand	2
Practical 5	Indigenous technical knowledge (ITK) for nutrient, insect, pest disease and weed management.	Experiments	BL3-Apply	2
Practical 6	Cost of organic production system.	Field work	BL3-Apply	2
Practical 7	Post harvest management. Quality aspect, grading, packaging and handling.	Field work	BL4-Analyze	2
Practical 8	Visit of organic farms to study the various components and their utilization.	BL5-Evaluate	2	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Reddy, S.R. 2017. Principles of Organic Farming. Kalyani Publishers.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-
CO3	-	3	3	1	1	2	1	1	2	-	1	1	-	-	2
CO4	-	3	3	1	1	-	-	1	-	-	1	1	-	1	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Agronomy

Title of the Course	Principles and Practices of Soil Fertility and Nutrient Management
Course Code	AGRON-502[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Agronomy, basic soil science			**Co-Requisite/s**	Agronomy, Scientific management of crop nutrients and soil.			
Course Outcomes & Bloom's Level	**CO1-** To gain basic knowledge of soil fertility and productivity **(BL1-Remember)** **CO2-** To study Importance or Significance of soil macronutrient and micronutrients **(BL2-Understand)** **CO3-** To Assess and develop importance of soil physical and chemical properties **(BL3-Apply)** **CO4-** To study about soil pollution and mitigation process **(BL4-Analyze)** **CO5-** To study about soil pollution and mitigation process **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG13(Climate action)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	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.	Brain storming, Guided learning, Cooperative Learning Strategies	6
Unit 2	Criteria of essentiality of nutrients; Essential plant nutrients - their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients.	Brain storming, , Critical incidents, Fieldwork and outdoor learning Activity based learning using different tools Flipped classes teaching model Collaborative learning Socratic method of teaching. Power Point Presentations. ABL activities Field demonstration of cropping and farming systems, ===== Assignment Quiz Seminars with open discussions Group discussions or debate	6
Unit 3	Preparation and use of farmyard manure, compost, green manures, vermin-compost, bio-fertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management. Soil less cultivation.	Brain storming, Critical incidents, Fieldwork and outdoor learning	6
Unit 4	Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, fertilizer mixtures and grades; methods of increasing fertilizer use efficiency; nutrient interactions.	Brain storming, Guided Questioning Fieldwork and outdoor learning, Talks and presentations	7
Unit 5	Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic nutrients; economics of fertilizer use; integrated nutrient management; use of vermicompost and residue wastes in crops.	Brain storming, Stimulus activities Fieldwork and outdoor learning,	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	1. Determination of soil pH	PBL		2
Practical 2	2. Determination of soil EC	PBL		2
Practical 3	3. Determination of soil organic C	PBL		2
Practical 4	4. Determination of available N, P, K and S of soil	PBL		2
Practical 5	5. Determination of total N, P, K and S of soil	PBL		2
Practical 6	6. Determination of total N, P, K, S in plant	PBL		2
Practical 7	7. Computation of optimum and economic yield	PBL		2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10	0		0	

Part E

Books	Brady ,N.C. and Weil, R,R. (2002). The Nature and Properties of Soils. 13th Ed. Pearson Education. Das, D.K. (2021) Introductory Soil Science. Generic
Articles	
References Books	Yawalkar, K.S., Agrawal, J.P. and Bokde, S. (2000). Manures and Fertilizers. Agri-Horti Publ. Havlin, J.L., Beaton, J.D., Tisdale, S.L. and Nelson, W.L. (2006). Soil Fertility and Fertilizers. 7th Ed. Prentice Hall.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	-	-	-	-	-	3	-	-	-	-	3	1	-
CO2	-	-	-	-	-	-	-	3	-	-	-	-	1	2	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Agronomy

Title of the Course	Principles and Practices of Weed Management
Course Code	AGRON-503 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Principles and practices of weed management			**Co-Requisite/s**	Principles and practices of weed management			
Course Outcomes & Bloom's Level	**CO1-** The knowledge on weed biology and survey of weeds in varied ecosystem. **(BL1-Remember)** **CO2-** Basic concept, introductory idea and classification of herbicides and its application methods and knowing about mode and mechanism of action of herbicides. **(BL2-Understand)** **CO3-** Basic concept, introductory idea and classification of herbicides and its application methods and knowing about mode and mechanism of action of herbicides. **(BL3-Apply)** **CO4-** Effective cultural, mechanical, biological, and chemical methods for managing weeds in different cropping system, crops and water weed **(BL4-Analyze)** **CO5-** Integrated weed management practices for different ecosystems **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education) SDG8(Decent work and economic growth) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices.	Brain storming, Fieldwork and outdoor learning, Cooperative Learning Strategies	6
Unit-2	Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides	Brain storming, Guided learning, Cooperative Learning Strategies Lab work	6
Unit-3	Herbicide structure - activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management; weed control through bio-herbicides, myco-herbicides and allele chemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation	Guided learning, Cooperative Learning Strategies, Talks and presentations	8
Unit-4	Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control	Cooperative Learning Strategies, Lab work, Fieldwork and outdoor learning Problem-based learning	6
Unit-5	Integrated weed management; cost: benefit analysis of weed management.	Fieldwork and outdoor learning Problem-based learning ,Discussions and Presentation, ABL	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unit-1	1. Identification of important weeds of different crops	Experiments	BL2-Understand	2
Unit-2	2. Preparation of a weed herbarium	Experiments	BL2-Understand	2
Unit-2	3. Weed survey in crops and cropping systems	Field work	BL3-Apply	2
Unit-3	4. Crop-weed competition studies	Field work	BL3-Apply	2
Unit-4	5. Preparation of spray solutions of herbicides for high and low-volume sprayers	Experiments	BL4-Analyze	2
Unit-4	6. Use of various types of spray pumps and nozzles and calculation of swath width	Experiments	BL4-Analyze	2
Unit-5	7. Economics of weed control	Field work	BL5-Evaluate	2
Unit-5	8. Herbicide resistance analysis in plant and soil	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10	0		0	

Part E

Books	Das TK. 2008. Weed Science: Basics and Applications, Jain Brothers (New Delhi). Kewat, M.L. and Sharma, R.S. (2007). A Practical Manual for Weed Control, College of Agriculture, JNVV, Jabalpur publication
Articles	Kewat, M.L. and Sharma, R.S. (2007). A Practical Manual for Weed Control, College of Agriculture, JNVV, Jabalpur publication
References Books	Walia US. 2006. Weed Management, Kalyani.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	-	-	-	-	-	-	-	-	-	3	1	-
CO2	-	-	-	-	-	-	1	-	-	1	-	-	1	2	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Agronomy

Title of the Course	Principles and Practices of Water Management
Course Code	AGRON-504 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Know the different irrigation projects, importance of water for crop production and different water resources of world and India **(BL1-Remember)** **CO2-** Water absorption, movement in soil and plant and stress condition of the crop **(BL2-Understand)** **CO3-** The principles involved in estimating water requirement, various methods of irrigation scheduling and approaches**(BL3-Apply)** **CO4-** Water management in crop and cropping systems and economize the water and known quality of water and its management **(BL4-Analyze)** **CO5-** Understand the effect of excess water on plant growth, drainage requirements of crop, layout and special irrigability of lands**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG2(Zero hunger) SDG8(Decent work and economic growth) SDG14(Life below water) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.	Brain storming, Guided learning, Cooperative Learning Strategies	6
Unit-2	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.	Brain storming, Guided learning, Cooperative Learning Strategies Lab work	6
Unit-3	Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; micro-irrigation system; ferti-gation management of water in controlled environments and poly-houses.	Guided learning, Cooperative Learning Strategies, Lab work, Fieldwork and outdoor learning	6
Unit-4	Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency.	Cooperative Learning Strategies, Lab work, Fieldwork and outdoor learning Problem-based learning	8
Unit-5	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.	Lab work, Fieldwork and outdoor learning Problem-based learning ,Discussions and Presentation, ABL	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	1. Measurement of soil water potential by using tensiometer, and pressure plate and membrane apparatus	Field work		2
Practical 2	2. Soil-moisture characteristics curves	Experiments		2
Practical 3	3. Water flow measurements using different devices	Case Study		2
Practical 4	4. Determination of irrigation requirements	Experiments		2
Practical 5	5. Calculation of irrigation efficiency	Field work		2
Practical 6	6. Determination of infiltration rate	Experiments		2
Practical 7	7. Determination of saturated/unsaturated hydraulic conductivity	Field work		2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10	0		0	

Part E

Books	1. Paliwal KV. 1972. Irrigation with Saline Water. IARI Monograph, New Delhi
Articles	
References Books	2. Panda SC. 2003. Principles and Practices of Water Management. Agrobios. 3. Reddy SR. 2000. Principles of Crop Production. Kalyani. 4. Singh Pratap&Maliwal PL. 2005. Technologies for Food Security and SustainableAgriculture. Agrotech Publ.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Agronomy

Title of the Course	Cropping System and Sustainable Agriculture
Course Code	AGRON-511 [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	crop cultivation			**Co-Requisite/s**	meteorology, soil science			
Course Outcomes & Bloom's Level	**CO1-** Identify the different Cropping systems, farming system and cropping pattern with their respective M.P. as well as north part of India, for sustainable resource management. **(BL1-Remember)** **CO2-** Describe the basic concepts of different competition relations between farming and cropping system component on above and below ground interactions and allelopathic effects. **(BL2-Understand)** **CO3-** Demonstrate various IFS model and sustainability approaches. **(BL3-Apply)** **CO4-** Analyse the opportunities and challenges in farming system for sustainable management of natural resources **(BL4-Analyze)** **CO5-** Assess the economic feasibility of different farming system component viz. cropping system, crop diversification, organic farming etc **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG11(Sustainable cities and economies) SDG13(Climate action)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Cropping systems: definition, indices and its importance; physical resources, soil and water management in cropping systems; assessment of land use.	Brain storming, Guided learning, Cooperative Learning Strategies, Fieldwork and outdoor learning	5
Unit 2	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	Brain storming, Guided learning, Cooperative Learning Strategies, Fieldwork and outdoor learning	5
Unit 3	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.	Guided learning, Cooperative Learning Strategies, Lab work, Fieldwork and outdoor learning	5
Unit 4	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. Advanced nutritional tools for big data analysis and interpretation.	Cooperative Learning Strategies, Lab work, Fieldwork and outdoor learning Problem-based learning	5
Unit 5	Plant ideotypes for drylands; plant growth regulators and their role in sustainability.	Lab work, Fieldwork and outdoor learning Problem-based learning ,Discussions and Presentation, ABL	6
Unit 6	Artificial Intelligence- Concept and application.	Brain storming, Guided learning, Cooperative Learning Strategies	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	41	50		50	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Panda, S.C. (2017). Cropping Systems and Sustainable Agriculture. Agrobios (India) Panda, S.C. (2018). Cropping and Farming Systems. Agrobios. Palaniappan, S.P., and Sivaraman, K. (1996). Cropping Systems in the Tropics; Principles and Management. New Age. Panda, S.C. (2003). Cropping and Farming Systems. Agrobios. Reddy, S.R. (2000). Principles of Crop Production. Kalyani. Sankaran, S., and Mudaliar, T.V.S. (1997). Principles of Agronomy. The Bangalore Printing & Publ. Co. Singh, S.S. (2006). Principles and Practices of Agronomy. Kalyani. Tisdale, S.L., Nelson, W.L., Beaton, J.D. and Havlin, J.L. (1997). Soil Fertility and Fertilizers. Prentice Hall.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	2	-	-	1	-	-	-	-	1	-	2
CO2	1	-	-	1	-	2	-	1	-	1	-	-	2	1	-
CO3	1	-	-	-	3	-	1	-	-	-	-	-	-	2	-
CO4	-	1	-	-	-	1	-	1	-	3	-	-	2	-	1
CO5	1	-	-	2	-	-	2	-	-	3	-	-	1	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Agronomy

Title of the Course	Dryland Farming and Watershed Management
Course Code	AGRON-512 [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	fundamentals of agronomy and soil science			**Co-Requisite/s**	crop cultivation and pattern			
Course Outcomes & Bloom's Level	**CO1-** Discuss the fundamental knowledge of mapping arid and semi-arid regions **(BL1-Remember)** **CO2-** Understand the skills required for integrated dry farming technologies **(BL2-Understand)** **CO3-** Apply the knowledge on soil and moisture conservation approaches and contingent crop plan to evade risk in dry farming. **(BL3-Apply)** **CO4-** Analyse the types of droughts, characterization of environment for water availability **(BL4-Analyze)** **CO5-** Assess practical knowledge on rain water harvesting techniques and watershed management principles. **(BL5-Evaluate)** **CO6-** Develop the IFS model for dry farming region **(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG3(Good health and well-being) SDG12(Responsible consuption and production) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in Indian agriculture.	Brain storming, Guided learning, Cooperative Learning Strategies	6
Unit 2	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.	Brain storming, Guided learning, Cooperative Learning Strategies, Fieldwork and outdoor learning	6
Unit 3	Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather conditions.	Guided learning, Cooperative Learning Strategies, Fieldwork and outdoor learning	7
Unit 4	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); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use	Cooperative Learning Strategies, Fieldwork and outdoor learning Problem-based learning	6
Unit 5	Concept of watershed resource management, problems, approach and components.	Fieldwork and outdoor learning Problem-based learning ,Discussions and Presentation, ABL	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	1. Method of Seed Priming Determination of moisture content of germination of important dryland crops	Experiments		2
Practical 2	2. Determination of Relative Water Content and Saturation Deficit of Leaf Moisture stress effects and recovery behaviour of important crops Estimation of Potential ET by Thornthwaite method	Experiments		2
Practical 3	3. Estimation of Reference ET by Penman Monteith Method Classification of climate by Thornthwaite method (based on moisture index, humidity index and aridity index)	Experiments		2
Practical 4	4. Classification of climate by Koppen Method Estimation of water balance by Thornthwaite method	Experiments		2
Practical 5	5. Estimation of water balance by FAO method Assessment of drought	Experiments		2
Practical 6	6. Estimation of length of growing period	Experiments		2
Practical 7	7. Estimation of probability of rain and crop planning for different drought condition	Field work		2
Practical 8	8. Spray of anti-transpirants and their effect on crops Water use efficiency	Experiments		2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10	0		0	

Part E

Books	Reddy, T.Y. (2018). Dryland Agriculture Principles and Practices, Kalyani publishers Das, N.R. (2007). Tillage and Crop Production. Scientific Publ. Dhopte, A.M. (2002). Agrotechnology for Dryland Farming. Scientific Publ. Dhruv Narayan, V.V. (2002). Soil and Water Conservation Research in India. ICAR. Gupta, U.S. (Ed.). (1995). Production and Improvements of Crops for Drylands. Oxford & IBH. Katyal, J.C. and Farrington, J. (1995). Research for Rainfed Farming. CRIDA.
Articles	
References Books	Rao, S.C. and Ryan, J. (2007). Challenges and Strategies of Dryland Agriculture. Scientific Publ. Singh, P. and Maliwal, P.L. (2005). Technologies for Food Security and Sustainable Agriculture. Agrotech Publ. Company. Singh, R.P. (1988). Improved Agronomic Practices for Dryland Crops. CRIDA. Singh, R.P. (2005). Sustainable Development of Dryland Agriculture in India. Scientific Publ. Singh, S.D. (1998). Arid Land Irrigation and Ecological Management. Scientific Publ. Venkateshwarlu, J. (2004). Rainfed Agriculture in India. Research and Development Scenario. ICAR.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	-	-	2	-	-	3	-	1	-	-	3
CO2	1	-	-	2	-	-	2	-	-	-	-	-	-	1	-
CO3	1	-	-	3	-	-	-	-	2	-	-	1	-	2	-
CO4	-	1	2	-	-	-	-	2	-	-	-	1	-	-	2
CO5	1	-	-	-	2	-	-	-	1	-	-	1	-	-	3
CO6	1	-	1	-	-	-	2	-	-	-	-	-	1	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Fundamentals of Crop Physiology
Course Code	CP-121[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Botany			**Co-Requisite/s**	Botany			
Course Outcomes & Bloom's Level	**CO1-** Describe the role and importance of plant physiology in crop growth and development**(BL1-Remember)** **CO2-** Explain the functions of various mineral nutrients in crop physiology**(BL2-Understand)** **CO3-** Demonstrate the effect of plant growth regulators or phyto-hormones in development of crop plants**(BL3-Apply)** **CO4-** Analyse the different metabolic pathways of bio-molecules**(BL4-Analyze)** **CO5-** Determine the different physiological growth parameters involved in development of agricultural crops**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction and historical perspectives and importance of crop physiology in agriculture. Plant cell and cytoplasmic organelles: structure and function.	Guided Questioning, Fieldwork and outdoor learning, Problem-based learning and BrainstormingGuided Questioning, Fieldwork and outdoor learning, Problem-based learning and Brainstormingignment, Classroom teaching, PPT Presentation, Quiz, Seminar, debate, Assignment, Extempore, Group discussions	3
Unit 2	Absorption of water: Diffusion and osmosis. Mechanism of absorption of water and ascent of sap. Transpiration: Kinds of transpiration and factors affecting transpiration. Stomata: Diffusion through stomatal pore, mechanism of opening and closing of stomatal guttation.	Guided Questioning, Fieldwork and outdoor learning, Problem-based learning and BrainstormingGuided Questioning, Fieldwork and outdoor learning, Problem-based learning and Brainstormingignment, Classroom teaching, PPT Presentation, Quiz, Seminar, debate, Assignment, Extempore, Group discussions	3
Unit 3	Introduction: essential elements and criteria of essentiality of minerals, physiological roles of mineral nutrition. Nutrient uptake mechanism and factors affecting salt absorption	Guided Questioning, Fieldwork and outdoor learning, Problem-based learning and BrainstormingGuided Questioning, Fieldwork and outdoor learning, Problem-based learning and Brainstormingignment, Classroom teaching, PPT Presentation, Quiz, Seminar, debate, Assignment, Extempore, Group discussions	3
Unit 4	Photosynthesis: Light and dark reactions, C3, C4 and CAM plants, photorespiration. Respiration: Glycolysis, Kreb's cycle and electron transport chain;fat metabolism, fatty acid synthesis and breakdown.	Guided Questioning, Fieldwork and outdoor learning, Problem-based learning and BrainstormingGuided Questioning, Fieldwork and outdoor learning, Problem-based learning and Brainstormingignment, Classroom teaching, PPT Presentation, Quiz, Seminar, debate, Assignment, Extempore, Group discussions	3
Unit 5	Plant growth regulators: Physiological roles and agricultural uses, physiological aspects of growth and development of major crops. Growth analysis: role, physiological growth parameters in crop productivity.	Guided Questioning, Fieldwork and outdoor learning, Problem-based learning and BrainstormingGuided Questioning, Fieldwork and outdoor learning, Problem-based learning and Brainstormingignment, Classroom teaching, PPT Presentation, Quiz, Seminar, debate, Assignment, Extempore, Group discussions	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Introduction to laboratory	Experiments	BL2-Understand	2
Practical 2	Laboratory glassware uses and cleaning	Experiments	BL3-Apply	2
Practical 3	Study of plant cell and its cellular organelles	Experiments	BL3-Apply	2
Practical 4	Structure and distribution of stomata	Experiments	BL3-Apply	2
Practical 5	Determination of the percentage of water imbibed by gram seeds	Experiments	BL3-Apply	2
Practical 6	Demonstration of the process of osmosis with varying concentration	Experiments	BL4-Analyze	2
Practical 7	Demonstrate of plasmolysis using onion cells	Experiments	BL4-Analyze	2
Practical 8	Comparison of rate of transpiration between the upper and lower surfaces o a leaf	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Gupta, S. and Gupta, N.K. (2018). Fundamentals of Crop Physiology B.Sc. Ag. ICAR. Kalyani.
Articles	NA
References Books	
MOOC Courses	
Videos	NA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	-	-	-	-	-	-	3	-	-
CO2	-	1	-	-	1	-	-	-	-	-	-	1	1	2	-
CO3	1	-	2	-	-	-	-	-	-	-	-	-	-	2	1
CO4	-	1	-	1	-	-	-	-	-	-	-	2	-	-	-
CO5	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Environmental Studies and Disaster Management
Course Code	CP-211 [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Environmental Science			**Co-Requisite/s**	Environmental Science			
Course Outcomes & Bloom's Level	**CO1-** Gain knowledge about environment and Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource. **(BL1-Remember)** **CO2-** To know about Ecosystem and gain knowledge, how biotic components depend upon the abiotic components. **(BL2-Understand)** **CO3-** Gain knowledge about the conservation of biodiversity and its importance. **(BL3-Apply)** **CO4-** Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures. **(BL4-Analyze)** **CO5-** Students are able to learn types of disasters causes and impact of disaster and International strategy for disaster reduction. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education) SDG6(Clean water and sanitation) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. e) Food resources. World food problems, Changes caused by agriculture and overgrazing. f) Land resources. Land as a resource, land degradation, man induced landslides, soil erosion.	case Study, Guided Learning and Brain Storming	6
Unit 2	Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem Forest ecosystem b. Grassland ecosystem c. Aquatic ecosystems (ponds).	case Study, Guided Learning and Brain Storming	6
Unit 3	Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and bio geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Exsitu conservation of biodiversity.	case Study, Guided Learning and Brain Storming	6
Unit 4	Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy. Water conservation. Environmental ethics: climate change, global warming. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.	case Study, Guided Learning and Brain Storming	7
Unit 5	Disaster Management: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, volcanic eruptions, Climatic change: global warming. Man Made Disasters- building fire, forest fire, air pollution, water pollution, deforestation, industrial waste water pollution. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction.	case Study, Guided Learning and Brain Storming	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-1	to study about Waste water sample collection, processing and preservation	Experiments	BL2-Understand	2
Module-2	To study about Biogas production from organic wastes	Experiments	BL2-Understand	2
Module-3	To Study of simple ecosystems-pond, river, hill slopes - Crop adaptation to different ecosystems	Experiments	BL2-Understand	2
Module-4	To study about Biodiversity assessment in polluted and un polluted system	Experiments	BL3-Apply	2
Module-5	To study about Visit to river/forest/grassland/hill/mountain to document environmental assets	Field work	BL3-Apply	2
Module-6	Estimation of acidity and alkalinity in water samples	Experiments	BL4-Analyze	2
Module-7	Estimation of water hardness	Experiments	BL4-Analyze	2
Module-8	To study about Solid waste management: composting and vermicomposting of farm wastes	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Gupta, J.P. (2009). Environmental studies, Laxmi Pub. Pvt. Ltd. Agarwal, K.C. (2001). Environmental; Biology, Nidi Pub. Ltd. Bikaner. Brunner R.C. (1989). Hazardous waste incineration, Mc Graw Hill Glick, H.P. (1993). water in crisis, Pacific Institute for studies in dev, Environment & security, Stockholm Env, Institute, Oxford Univ, Press 473 p. Odum, E.P. (1997). Fundamental chemistry, Goel Pub House Meerut.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	1	-	-	-	-	-	3	-	-
CO2	-	1	2	2	1	2	3	2	-	-	-	1	1	2	-
CO3	2	-	1	2	1	3	2	3	1	-	-	2	-	2	1
CO4	-	1	-	1	-	-	-	3	-	-	-	2	-	-	-
CO5	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Environmental Studies and Disaster Management
Course Code	CP-311 [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Environmental Science			**Co-Requisite/s**	Environmental Science			
Course Outcomes & Bloom's Level	**CO1-** Gain knowledge about environment and Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource. **(BL1-Remember)** **CO2-** To know about Ecosystem and gain knowledge, how biotic components depend upon the abiotic components. **(BL2-Understand)** **CO3-** Gain knowledge about the conservation of biodiversity and its importance. **(BL3-Apply)** **CO4-** Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures. **(BL4-Analyze)** **CO5-** Students are able to learn types of disasters causes and impact of disaster and International strategy for disaster reduction. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. e) Food resources. World food problems, Changes caused by agriculture and overgrazing. f) Land resources. Land as a resource, land degradation, man induced landslides, soil erosion.	Case Study, Guided Learning and Brain Storming	6
Unit 2	Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem Forest ecosystem b. Grassland ecosystem c. Aquatic ecosystems (ponds).	Case Study, Guided Learning and Brain Storming	7
Unit 3	Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and bio geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Exsitu conservation of biodiversity.	Case Study, Guided Learning and Brain Storming	7
Unit 4	Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy. Water conservation. Environmental ethics: climate change, global warming. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.	Case Study, Guided Learning and Brain Storming	7
Unit 5	Disaster Management: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, volcanic eruptions, Climatic change: global warming. Man Made Disasters- building fire, forest fire, air pollution, water pollution, deforestation, industrial waste water pollution. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction.	Case Study, Guided Learning and Brain Storming	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-1	to study about Waste water sample collection, processing and preservation	Experiments	BL2-Understand	2
Module-2	To study about Biogas production from organic wastes	Experiments	BL2-Understand	2
Module-3	To Study of simple ecosystems-pond, river, hill slopes - Crop adaptation to different ecosystems	Experiments	BL2-Understand	2
Module-4	To study about Biodiversity assessment in polluted and un polluted system	Experiments	BL3-Apply	2
Module-5	To study about Visit to river/forest/grassland/hill/mountain to document environmental assets	Field work	BL3-Apply	2
Module-6	Estimation of acidity and alkalinity in water samples	Experiments	BL4-Analyze	2
Module-7	Estimation of water hardness	Experiments	BL4-Analyze	2
Module-8	To study about Solid waste management: composting and vermicomposting of farm wastes	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Gupta, J.P. (2009). Environmental studies, Laxmi Pub. Pvt. Ltd. Agarwal, K.C. (2001). Environmental; Biology, Nidi Pub. Ltd. Bikaner. Brunner R.C. (1989). Hazardous waste incineration, Mc Graw Hill Glick, H.P. (1993). water in crisis, Pacific Institute for studies in dev, Environment & security, Stockholm Env, Institute, Oxford Univ, Press 473 p. Odum, E.P. (1997). Fundamental chemistry, Goel Pub House Meerut.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	1	-	-	-	-	-	3	-	-
CO2	-	1	2	2	1	2	3	2	-	-	-	1	1	2	-
CO3	2	-	1	2	1	3	2	3	1	-	-	2	-	2	1
CO4	-	1	-	1	-	-	-	3	-	-	-	2	-	-	-
CO5	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Biopesticides and Biofertilizers
Course Code	ELCT-ENT-311[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Electives							
Pre-Requisite/s	Agricultural Chemicals			**Co-Requisite/s**	Plant Protection			
Course Outcomes & Bloom's Level	**CO1-** Describe the importance of bio-pesticides in present scenario. **(BL1-Remember)** **CO2-** Explain the concepts and classification of bio-fertilizers and bio-pesticides **(BL2-Understand)** **CO3-** Utilize the quality parameters of various agricultural products and bio-fertilizer in maintaining the soil health**(BL3-Apply)** **CO4-** Examine the significance and implementation of bio-pesticide and bio-fertilizer in organic farming**(BL4-Analyze)** **CO5-** Determine the performance of bio-pesticides/ bio-fertilizers through field application**(BL5-Evaluate)** **CO6-** Formulate the various bio-pesticides and bio-fertilizers**(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses.	Class room teaching (chalk-board) Power Point Presentations ABL activities Assignments Quiz	6
Unit 2	Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.	Class room teaching (chalk-board) Power Point Presentations ABL activities Assignments Quiz	6
Unit 3	Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.	Class room teaching (chalk-board) Power Point Presentations ABL activities Assignments Quiz	6
Unit 4	Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia; Cynobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.	Class room teaching (chalk-board) Power Point Presentations ABL activities Assignments Quiz	7
Unit 5	Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers.	Class room teaching (chalk-board) Power Point Presentations ABL activities Assignments Quiz	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Isolation and purification of important biopesticides: Trichoderma, Pseudomonas, Bacillus, Metarhyzium etc. and its production.	Experiments	BL2-Understand	2
Practical 2	Identification of important botanicals	Field work	BL3-Apply	2
Practical 3	Visit to biopesticide laboratory in nearby area.	Field work	BL3-Apply	2
Practical 4	Field visit to explore naturally infected cadavers.	Field work	BL3-Apply	2
Practical 5	Identification of entomopathogenic entities in field condition	Experiments	BL4-Analyze	2
Practical 6	Quality control of biopesticides	Experiments	BL4-Analyze	2
Practical 7	Isolation and purification of Azospirillum, Azotobacter, Rhizobium, P-solubilizers and cyanobacteria	Field work	BL4-Analyze	2
Practical 8	Mass multiplication and inoculums production of biofertilizers.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	David, B. V. and Ramamurthy, V.V. 2016. Elements of Economic Entomology. Brillion Publishing. Prasad, T.V. 2014. Handbook of Entomology. New Vishal Publications Das, D.K. 2011. Soil Science. Kalyani.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	1	-	-	-	-	-	-	-	3	1	-
CO2	-	1	1	-	2	-	1	-	-	-	2	-	-	3	-
CO3	2	-	2	1	2	-	1	-	-	-	1	1	-	-	2
CO4	-	1	1	-	-	-	-	-	-	-	-	2	-	-	-
CO5	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Agrochemicals
Course Code	ELCT-ENT-321[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Agricultural chemicals			**Co-Requisite/s**	Agricultural chemicals			
Course Outcomes & Bloom's Level	**CO1-** acquaint with the advantages and disadvantages of pesticides, plant growth regulators and fertilizers in present scenario. **(BL1-Remember)** **CO2-** classify pesticides and fertilizers on the basis of various parameters**(BL2-Understand)** **CO3-** apply pesticides for the protection of plants and fertilizers to maintain soil health. **(BL3-Apply)** **CO4-** analyze the residual effect of pesticides and fertilizers. **(BL4-Analyze)** **CO5-** evaluate the efficacy of pesticides formulation and fertilizers through field application. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.	Activity based learning through lab experimentation Power Point Presentations ABL activities Assignments Flip Class/ Seminars One word/ single phrase answer tests	3
Unit 2	Herbicides-Major classes, properties and important herbicides - Fate of herbicides. Fungicides - Classification Inorganic fungicides - Characteristics, preparation and use of sulphur and copper - Mode of action-Bordeaux mixture and copperoxychloride. Organic fungicides-Mode of action-Dithiocarbamates-Characteristics, preparation and use of Zineb and Maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.	Activity based learning through lab experimentation Power Point Presentations ABL activities Assignments Flip Class/ Seminars One word/ single phrase answer tests	3
Unit 3	Introduction and classification of insecticides: inorganic and organic insecticides - Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids, Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Bio-pesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.	Activity based learning through lab experimentation Power Point Presentations ABL activities Assignments Flip Class/ Seminars One word/ single phrase answer tests	3
Unit 4	Fertilizers and their importance. Nitrogenous fertilizers- Feed stocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers-feedstock and manufacturing of single. Super-phosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate.	Activity based learning through lab experimentation Power Point Presentations ABL activities Assignments Flip Class/ Seminars One word/ single phrase answer tests	3
Unit 5	Mixed and complex fertilizers-Sources and compatibility preparation of major, secondary and micro nutrient mixtures. Complex fertilizers- Manufacturing of ammonium phosphates, nitro-phosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bioinsect repellent.	Activity based learning through lab experimentation Power Point Presentations ABL activities Assignments Flip Class/ Seminars One word/ single phrase answer tests	4

M

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Sampling of fertilizers and pesticides.	Field work	BL2-Understand	2
Practical 2	Pesticides application technology to study about various pesticides appliances.	Field work	BL3-Apply	2
Practical 3	Quick tests for identification of common fertilizers.	Experiments	BL3-Apply	2
Practical 4	Identification of anion and cation in fertilizer.	Experiments	BL3-Apply	2
Practical 5	Calculation of doses of insecticides to be used.	Experiments	BL3-Apply	2
Practical 6	To study and identify various formulations of insecticide available in market.	Experiments	BL3-Apply	2
Practical 7	Estimation of nitrogen in Urea.	Experiments	BL4-Analyze	2
Practical 8	Estimation of water soluble P2 O5 and citrate soluble P2 O5 in single super phosphate.	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Vasantharaj David, B and Ramamurthy V. V. (2016). Elements of Economic Entomology. Np Namuratha Publications, Chennai. Vasantharaj David, B. and Aanathakrishnan, T.N. (2006). General and Applied Entomology. Tata McGraw-Hill Publishing House, New Delhi. Srivastava, R. P. and Saxena, R. C. (1989). A text book of Insect toxicology. Himanshu Publications, Udaipur. Sriramulu, S. (1979). Methods of Pesticide analysis. Oxford IBH, New Delhi
Articles	
References Books	Müller, F. (2000). Agrochemicals: Composition, Production, Toxicology, Applications. Wiley Cremlyn, R. J. (1991). Agrochemicals: Preparation and Mode of Action. Wiley–Blackwell.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	1	-	-	-	-	-	-	-	3	1	-
CO2	-	2	1	-	2	-	-	-	-	-	2	-	-	3	-
CO3	2	-	2	1	2	-	1	-	-	-	1	1	-	-	2
CO4	-	1	1	-	-	-	1	-	-	-	-	2	-	-	-
CO5	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Hi-tech. Horticulture
Course Code	ELCT-HORT-221[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Electives							
Pre-Requisite/s	Horticulture			**Co-Requisite/s**	Horticulture			
Course Outcomes & Bloom's Level	**CO1-** Students will be equipped with sufficient theoretical knowledge with practical skills on hi-tech horticulture technology and methods **(BL1-Remember)** **CO2-** Theoretical knowledge about precision farming and various implements used in nursery preparation. **(BL2-Understand)** **CO3-** Study about INM & IPM, IWM, protected cultivation, remote sensing and GIS and DGPS. **(BL3-Apply)** **CO4-** Ability to use techniques and instruments involved in the study of orchard practice equipment **(BL4-Analyze)** **CO5-** Understand the basic practice of nursery preparation and propagation method **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction, importance & scope of hi-tech horticulture in India	Classroom lecture, ABL, Fieldwork, Solution based learning and PBL	6
Unit 2	Micro irrigation systems & its components/pH-based irrigation/ fertigation scheduling, Hi-tech canopy management of horticultural crops, High density orcharding in Mango, guava, papaya, citrus, pineapple etc.	Classroom lecture, ABL, Fieldwork, Solution based learning and PBL	6
Unit 3	Micropropagation of horticultural crops, hi-tech field preparation and planting methods, Protected cultivation.	Classroom lecture, ABL, Fieldwork, Solution based learning and PBL	6
Unit 4	Remote sensing & geographical information system, Differential geopositioning system (DGPS), Component of precision farming & application of precision farming in horticultural crops.	Classroom lecture, ABL, Fieldwork, Solution based learning and PBL	7
Unit 5	Importance of INM in horticulture. Micro irrigation methods, Nursery management in horticultural crops.	Classroom lecture, ABL, Fieldwork, Solution based learning and PBL	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Identification of protected structure	Field work	BL2-Understand	2
Practical 2	Nursery management of horticultural crops	Field work	BL2-Understand	2
Practical 3	Micropropagation in horticulture crops	Field work	BL3-Apply	2
Practical 4	Micro-irrigation system	Field work	BL3-Apply	2
Practical 5	H.D.P. of orchard	Field work	BL3-Apply	2
Practical 6	Canopy management of fruit trees	Field work	BL4-Analyze	2
Practical 7	EC, ph. Based fertilizer scheduling	Field work	BL4-Analyze	2
Practical 8	Tools and equipment's identification and use	Field work	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	More, T.A., Singh, R.B. (2005). Protected cultivation of vegetable crops. Kalyani publication
Articles	
References Books	Prasad, S. and Kumar, U. 1998. Commercial floriculture. Agro Botanica
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	-	-	-	-	-	-	-	-	3	1	-
CO2	-	1	1	-	1	-	-	-	-	-	-	-	1	2	-
CO3	2	-	1	1	1	-	1	-	-	-	-	2	-	3	1
CO4	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	-	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Protected Cultivation
Course Code	ELCT-HORT-321[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Horticulture			**Co-Requisite/s**	Horticulture			
Course Outcomes & Bloom's Level	**CO1-** To list out and remember the importance of Protected cultivation and its scope in India. **(BL1-Remember)** **CO2-** To classify the concept of classifications of protected structures. **(BL2-Understand)** **CO3-** To apply the concept of protected cultivation for major crops. **(BL3-Apply)** **CO4-** To examine the Basics of nursery management under protected structures. **(BL4-Analyze)** **CO5-** To evaluate the utility of growing media and growing condition under protected structures. **(BL5-Evaluate)** **CO6-** To create the budget and design for protected cultivation and structures. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to Protected cultivation Protected cultivation- importance and scope, Status of protected cultivation in India and World	Class room teaching (Chalk-board) Power Point Presentations ABL activities Assignments Flip Class/ Seminars Quiz	6
Unit 2	Construction and types of protected structures Cladding materials involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation, Soil preparation and management, Substrate management. Types of benches and containers. Types of protected structure based on site and climate	Class room teaching (Chalk-board) Power Point Presentations ABL activities Assignments Flip Class/ Seminars Quiz	6
Unit 3	Irrigation and propagation under protected structures Irrigation and fertigation management, Propagation and production of quality planting material of horticultural crops	Class room teaching (Chalk-board) Power Point Presentations ABL activities Assignments Flip Class/ Seminars Quiz	6
Unit 4	Greenhouse cultivation of important horticultural crops Greenhouse cultivation of important horticultural crops rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.	Class room teaching (Chalk-board) Power Point Presentations ABL activities Assignments Flip Class/ Seminars Quiz	7
Unit 5	Cultivation of economically important crops Cultivation of economically important medicinal and aromatic plants. Offseason production of flowers and vegetables. Insect pest and disease management under protected structures.	Class room teaching (Chalk-board) Power Point Presentations ABL activities Assignments Flip Class/ Seminars Quiz	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Preparation and nursery management under Protected structures	Experiments	BL2-Understand	2
Practical 2	Propagation and nursery management under Protected structures	Experiments	BL3-Apply	2
Practical 3	Bed preparation and planting of crops for productions	Experiments	BL3-Apply	2
Practical 4	Intercultural operations	Experiments	BL4-Analyze	2
Practical 5	Soil EC and pH measurement	Experiments	BL4-Analyze	2
Practical 6	Regulation of irrigation and fertilizers through drip, fogging ad misting	Experiments	BL5-Evaluate	2
Practical 7	Propagation and management of Ornamental and medicinal/Aromatic crops.	Experiments	BL5-Evaluate	2
Practical 8	Visit to Protected structure	Experiments	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Salone, V.M. and Sharma. A.K. (2012). Greenhouse Technology and Applications. Agrotech Publishers. New Delhi. Prasad S. and Kumar, U. (2012). Greenhouse Management of Horticultural Crops. Second edition. Agrobios. New Delhi.
Articles	
References Books	Hanan, J.J. (1998). Green houses: Advanced Technology for Protected Horticulture. CRC Press, LLC. Florida. Radha Manohar, K. and Igathinathane, C. (2013). Greenhouse Technology and Management. BS Publications.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	-	-	-	-	-	-	-	-	3	1	-
CO2	-	1	1	-	1	-	-	-	-	-	-	-	1	2	-
CO3	2	-	1	1	1	-	1	-	-	-	-	2	-	1	1
CO4	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	-	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	2	-	-	-	-	-	-	-	2	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Weed Management
Course Code	ELCT–AGRON-221[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Electives							
Pre-Requisite/s	Agronomy			**Co-Requisite/s**	Agronomy			
Course Outcomes & Bloom's Level	**CO1-** Describe the basics concepts of weeds management different weed plants and herbicides along with their respective characteristics & nature **(BL1-Remember)** **CO2-** Classify and characterized various crop weed plants and herbicides based on different parameters **(BL2-Understand)** **CO3-** Demonstrate the use of different methods and technology of weed management in the field **(BL3-Apply)** **CO4-** Investigate the differential effects of various herbicides on different weed plants and examine and cause and management of herbicide resistance **(BL4-Analyze)** **CO5-** Evaluate the integrated weed management (IWM) models in different crops under different crop-weed ecology **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem.	ABL activities, Assignment, Class room teaching, PPT presentation, Quiz, group discussion, Unannounced test.	6
Unit 2	classification, reproduction and dissemination of weeds. Herbicide classification, concept of adjuvant, surfactant herbicide formulation and their use.	ABL activities, Assignment, Class room teaching, PPT presentation, Quiz, group discussion, Unannounced test.	6
Unit 3	Introduction to mode of action of Herbicides selectivity. allelopathy and its application for weed management.	ABL activities, Assignment, Class room teaching, PPT presentation, Quiz, group discussion, Unannounced test.	6
Unit 4	Bio-herbicides and their application in agriculture. concept of herbicide mixture and utility in agriculture Herbicide compatibility with agro-chemicals and their application.	ABL activities, Assignment, Class room teaching, PPT presentation, Quiz, group discussion, Unannounced test.	7
Unit 5	Integration of herbicides with non-chemical methods of weed management and its management. Herbicide resistance and its management.	ABL activities, Assignment, Class room teaching, PPT presentation, Quiz, group discussion, Unannounced test.	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Techniques of weed preservation.	Field work	BL2-Understand	2
Practical 2	Weed identification and their losses Study.	Field work	BL2-Understand	2
Practical 3	Biology of important weeds.	Field work	BL2-Understand	2
Practical 4	Study of herbicide formulations mixture of herbicides	Field work	BL3-Apply	2
Practical 5	Herbicide and agro-Chemical study.	Field work	BL3-Apply	2
Practical 6	Shift of weed flora Study in long-term experiments.	Field work	BL4-Analyze	2
Practical 7	Study of methods of herbicide application, Spraying equipment.	Experiments	BL4-Analyze	2
Practical 8	Calculations of herbicide doses and weed control efficiency and weed index.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Naylor, R. E. L. (2002). Weed Management Handbook. Wiley-Blackwell.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	2	-	1	-	-	-	-	-	3	1	-
CO2	-	1	3	2	2	2	1	-	-	-	-	-	1	2	-
CO3	2	-	3	2	2	2	2	1	-	-	1	1	-	-	2
CO4	-	1	-	3	-	-	-	1	-	-	1	-	-	1	-
CO5	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Fundamentals of Entomology
Course Code	ENT-121[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Biology at secondary level			**Co-Requisite/s**	Agriculture at secondary level			
Course Outcomes & Bloom's Level	**CO1-** Describe the structure and function of insect along with their ecology.**(BL1-Remember)** **CO2-** Classify insects according to their morphology, anatomy and physiology.**(BL2-Understand)** **CO3-** Demonstrate the relationship of insect appendages with their habit and habitat.**(BL3-Apply)** **CO4-** Analyse the effect of climatic conditions on insect life.**(BL4-Analyze)** **CO5-** Evaluate the insect behavior in relation to other organisms present in their niche and ecosystem.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	9
Unit 2	Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	9
Unit 3	Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors food competition, natural and environmental resistance.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	10
Unit 4	Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control importance, hazards and limitations. Recent methods of pest control, repellents, antifeed ants, hormones, attractants, gamma radiation. Insecticides Act 1968-Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	10
Unit 5	Systematics: Taxonomy importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Methods of collection and preservation of insects including immature stages	Experiments	BL2-Understand	2
Practical 2	External features of Grasshopper/Blister beetle;	Experiments	BL2-Understand	2
Practical 3	Types of insect antennae, mouthparts and legs;	Experiments	BL2-Understand	2
Practical 4	Wing venation, types of wings and wing coupling apparatus.	Experiments	BL3-Apply	2
Practical 5	Types of insect larvae and pupae;	Experiments	BL3-Apply	2
Practical 6	Dissection of digestive system in insects (Grasshopper);	Experiments	BL3-Apply	2
Practical 7	Dissection of male and female reproductive systems in insects (Grasshopper);	Experiments	BL4-Analyze	2
Practical 8	Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Sherwood, C. (2022). Introduction to Entomology. Murphy & Moore Publishing.
Articles	NA
References Books	
MOOC Courses	
Videos	NA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	-	-	-	-	-	-	3	1	-
CO2	-	2	1	-	-	1	1	-	-	-	-	1	1	2	-
CO3	2	-	1	-	-	1	2	-	-	-	-	1	-	-	2
CO4	-	1	1	-	-	-	1	-	-	-	-	-	-	-	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Pests of Crops and Stored Grain and their Management
Course Code	ENT-311 [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Fundamentals of entomology			**Co-Requisite/s**	Insect ecology and morphology			
Course Outcomes & Bloom's Level	**CO1-** Familiarized with identification of different insect pest of field, horticulture, ornamentals, vegetables and stored grains at the field level.**(BL1-Remember)** **CO2-** Understand how insects affect animal and Plant health and agricultural production, and be able to safely manipulate populations of beneficial and destructive species in habitats and in production agro-ecosystems with minimal environmental impact**(BL2-Understand)** **CO3-** To be able about the biology, diversity, distribution of insects, and their relationships to crop and the environment condition of a particular area**(BL3-Apply)** **CO4-** To understand identification of nature of damage and symptoms caused by the pest so suitable technique of pest management can be apply for effective control.**(BL4-Analyze)** **CO5-** Management of crop pest through Integrated Pest Management approach without side effect on plant, animal and environment health**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	General account on nature and type of damage by different arthropods pests. In general study of Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod.	ABL, field & Outdoor learning and Brain Storming	6
Unit-2	Pests of various field crop, cereals and oil seeds Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod	ABL, field & Outdoor learning and Brain Storming	6
Unit-3	vegetable crop, Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod	ABL, field & Outdoor learning and Brain Storming	6
Unit-4	Fruit crop, plantation crops, ornamental crops, spices and condiments. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod	ABL, field & Outdoor learning and Brain Storming	7
Unit-5	Mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management	ABL, field & Outdoor learning and Brain Storming	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	To study about Identification of different types of damage	Field work	BL2-Understand	2
Practical 2	To study about Pests of paddy	Field work	BL2-Understand	2
Practical 3	To study about Identification and study of life cycle and seasonal history of various insect pests attacking vegetable crops and their produce	Field work	BL3-Apply	2
Practical 4	To study about identification of insect pests and Mites associated with stored grain	Field work	BL3-Apply	2
Practical 5	To study about Determination of insect infestation by different methods	Experiments	BL4-Analyze	2
Practical 6	To study about assessment of losses due to insects	Experiments	BL4-Analyze	2
Practical 7	To study about Calculations on the doses of insecticides application technique.	Experiments	BL5-Evaluate	2
Practical 8	To study about Identification of rodents and rodent control operations in godowns.	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Chaube, H.S and V.S. Pundhir, 2012. Crop Diseases & Their Management. PHI Pvt.Ltd, New Delhi. Rangaswami, G &Mahadevan, K.2001. Diseases of crop plants in India, Prentice Hall of India Pvt.Ltd, New Delhi.
Articles	
References Books	George N. Agrios. 2005. Plant Pathology 5th Edition, Academic Press University of Florida, Gainesville, U.S.A. Singh, R.S.2005. Plant Diseases. Oxford & IBH Publications, New Delhi
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Management of Beneficial Insect
Course Code	ENT-321[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Entomology			**Co-Requisite/s**	Entomology			
Course Outcomes & Bloom's Level	**CO1-** Describe the importance of beneficial insects including pollinators, parasitoids and predators. **(BL1-Remember)** **CO2-** Explain the rearing techniques and management practices of beneficial insects according to their behavioural and ecological aspects **(BL2-Understand)** **CO3-** Demonstrate the mass multiplication techniques of commercial insects and biological control agents. **(BL3-Apply)** **CO4-** Analyse the effect of cultivation methods of commercial insect on their produce and also mass rearing techniques of bio-control agents **(BL4-Analyze)** **CO5-** Evaluate the effect of natural enemies on the pest management**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management.	Spot identification, Herberia, ABL and Problem based learning	3
Unit 2	Bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.	Spot identification, Herberia, ABL and Problem based learning	3
Unit 3	Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.	Spot identification, Herberia, ABL and Problem based learning	3
Unit 4	Species of lac insect, morphology, biology, host plant, lac production seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control.	Spot identification, Herberia, ABL and Problem based learning	3
Unit 5	Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.	Spot identification, Herberia, ABL and Problem based learning	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Honey bee species, castes of bees	Field work	BL2-Understand	2
Practical 2	eekeeping appliances and seasonal management, bee enemies and disease.	Field work	BL2-Understand	2
Practical 3	Bee pasturage, bee foraging and communication.	Field work	BL3-Apply	2
Practical 4	Types of silkworm, voltinism and biology of silkworm.	Field work	BL3-Apply	2
Practical 5	Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.	Field work	BL3-Apply	2
Practical 6	Species of lac insect, host plant identification	Field work	BL4-Analyze	2
Practical 7	Identification of other important pollinators, weed killers and scavengers.	Field work	BL4-Analyze	2
Practical 8	Visit to research and training institutions devoted to beekeeping.	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Sabu, T. K. (2012). Selected Beneficial and Harmful Insects of Indian Subcontinent. LAP Lambert Academic Publishing. The Xerces Society. (2014). Farming with Native Beneficial Insects: Ecological Pest Control Solutions Kindle Edition. Storey Publishing, LLC. Abrol, D.P. (2010). Bees and Beekeeping in India. Kalyani Publishers, New Delhi, India. Atwal, A.S. (2000). Essentials of Beekeeping and Pollination. Kalyani Publishers, New DelhiLudhiana, India. Ministry of Agriculture and Fisheries. (2018). Beneficial Insects (Classic Reprint). Forgotten Books.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	2	-	1	-	-	-	-	-	2	1	-
CO2	-	1	1	2	1	2	2	1	-	-	1	1	1	3	-
CO3	3	-	2	3	2	1	3	2	-	-	2	2	-	-	2
CO4	-	1	-	1	-	-	-	1	-	-	1	1	-	-	-
CO5	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Horticulture_Vegetable_Science

Title of the Course	Nutrition of Fruit Crops
Course Code	FSC-508[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describe the basic concepts and principles of Nutrition in fruit crops **(BL1-Remember)** **CO2-** Understand the importance and various types of nutrients and their uptake mechanisms**(BL2-Understand)** **CO3-** Apply the corrective measures to overcome deficiency or toxicity**(BL3-Apply)** **CO4-** Analyse soil and plant status with respect to various nutrients**(BL4-Analyze)** **CO5-** Evaluate the role various nutrients on yield and quality of fruit crops **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
1	General Concepts and Principles: Importance and history of nutrition in fruit crops, essential plant nutrients, factors affecting plant nutrition; nutrient uptake and their removal from soil.	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming Problem-based learning	2
2	Diagnostics, Estimation and Application: Nutrient requirements, root distribution in fruit crops, soil and foliar application of nutrients in major fruit crops, fertilizer use efficiency.	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming Problem-based learning	2
3	Methods and techniques for evaluating the requirement of macro- and micro-elements, Diagnostic and interpretation techniques including DRIS	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming Problem-based learning	2
4	: Role of different macro and micro-nutrients, their deficiency and toxicity disorders, corrective measures to overcome deficiency and toxicity disorders.	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming Problem-based learning	2
5	Integrated Nutrient Management (INM): Fertigation in fruit crops, biofertilizers and their use in INM systems.	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming Problem-based learning	2

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Visual identification of nutrient deficiency symptoms in fruit crops	PBL		
Practical 2	Identification and application of organic, inorganic and bio- fertilizers	PBL		
Practical 3	Soil/ tissue collection and preparation for macro- and micro- nutrient analysis	PBL		
Practical 4	Analysis of soil physical and chemical properties- pH, EC, Organic carbon	PBL		
Practical 5	Determination of N,P,K and other macro- and micronutrients	PBL		
Practical 6	Fertigation in glasshouse and field grown horticultural crops	PBL		
Practical 7	Preparation of micro-nutrient solutions, their spray and soil applications	PBL		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	41	50		50	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	• Atkinson D, Jackson JE and Sharples RO. 1980. Mineral Nutrition of Fruit Trees. Butterworth – Heinemann. • Bould C, Hewitt EJ and Needham P. 1983. Diagnosis of Mineral Disorders in Plants Vol.1 Principles. Her Majesty's Stationery Office, London. • Cooke GW. 1972. Fertilizers for maximizing yield. Grenada Publishing Ltd, London. • Epstein E. 1972. Mineral Nutrition of Plants: Principles and Perspectives. Wiley Eastern Ltd. • Kanwar JS. 1976. Soil Fertility-Theory and Practice. ICAR, New Delhi. • Marchner Horst. 1995. Mineral Nutrition of Higher Plants, 2nd Ed. Marschner, Academic Press Inc. San Diego, CA. • Mengel K and Kirkby EA. 1987. Principles of Plant Nutrition. 4th Ed. International Potash Institute, Worblaufen-Bern, Switzerland. • Prakash M. 2013. Nutritional Disorders in Fruit Crops: Diagnosis and Management. NIPA, New Delhi. • Tandon HLS. 1992. Management of Nutrient Interactions in Agriculture. Fertilizer Development and Consultation Organization, New Delhi. • Westerman RL. 1990. Soil Testing and Plant Analysis, 3rd Ed. Soil Science Society of America, Inc., Madison, WI. • Yawalkar KS, Agarwal JP and Bokde S. 1972. Manures and Fertilizers. 3rd Ed. Agri Horticultural Publishing House, Nagpur.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	1	-	-	-	-	2	-	-	-
CO3	-	1	1	-	-	1	2	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	1	-	1	-	-	1	-	-	-
CO5	1	1	1	-	-	1	1	-	1	-	-	1	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Genetics_and_Plant_Breeding

Title of the Course	Breeding for Stress Resistance and Climate Change
Course Code	GPB-516[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Fundamental of Plant Breeding			**Co-Requisite/s**	Basics of Biotechnology			
Course Outcomes & Bloom's Level	**CO1-** Define the fundamental concepts and theories of stress resistance and climate change. **(BL1-Remember)** **CO2-** Describe the nature and structure of breeding for stress resistance and climate change. **(BL2-Understand)** **CO3-** Conceptualize stress resistance management and hands on lab tools and techniques **(BL3-Apply)** **CO4-** Apply the concepts of breeding for stress resistance and climate change.**(BL4-Analyze)** **CO5-** Problems based on breeding strategies for stress resistance and climate change.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Concept and impact of climatic change; Importance of plant breeding with special reference to biotic and abiotic stress resistance; Classification of biotic stresses – major pests and diseases of economically important crops.	Class room lecture, PBL, Field work,Herberia development	6
Unit 2	Concepts of resistance to insect and pathogen resistance; Analysis and inheritance of resistance variation; Host defence responses to pathogen invasions- Biochemical and molecular mechanisms; Acquired and induced immunity and systemic acquired resistance (SAR); Host-pathogen interaction, gene-for-gene hypothesis, molecular evidence for its operation and exceptions; Concept of signal transduction and other host-defence mechanisms against viruses and bacteria.	Class room lecture, PBL, Field work,Herberia development	6
Unit 3	Types and genetic mechanisms of resistance to biotic stresses –Horizontal and vertical resistance in crop plants; Quantitative resistance/ adult plant resistance and slow rusting resistance; Classical and molecular breeding methods - Measuring plant resistance using plant fitness; Behavioural, physiological and insect gain studies; Phenotypic screening methods for major pests and diseases; Recording of observations; Correlating the observations using marker data – Gene pyramiding methods and their implications. Classification of abiotic stresses - Stress inducing factors, moisture stress/ drought and water logging and submergence; Acidity, salinity/ alkalinity/ sodicity; High/ low temperature, wind, etc.; Stress due to soil factors and mineral toxicity; Physiological and Phenological responses; Emphasis of abiotic stresses in developing breeding methodologies.	Class room lecture, PBL, Field work,Herberia development	6
Unit 4	Genetics of abiotic stress resistance; Genes and genomics in breeding cultivars suitable to low water regimes and water logging and submergence, high and low/ freezing temperatures; Utilizing MAS procedures for identifying resistant types in important crops like rice, sorghum, wheat, cotton, etc.; Breeding for resistance to stresses caused by toxicity, deficiency and pollutants/ contaminants in soil, water and environment.	Class room lecture, PBL, Field work,Herberia development	6
Unit 5	Use of crop wild relatives as a source of resistance to biotic and abiotic factors in major field crops; Transgenics in management of biotic and abiotic stresses, use of toxins, protease inhibitors, lectins, chitinases and Bt for diseases and insect pest management.	Class room lecture, PBL, Field work,Herberia development	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Understanding the climatological parameters and predisposal of biotic and abiotic stress factors- ways of combating them for diseases caused by fungi and bacteria;	Field work	BL2-Understand	2
Practical 2	Symptoms and data recording; use of MAS procedures;	Field work	BL2-Understand	2
Practical 3	Phenotypic screening techniques for sucking pests and chewing pests – Traits to be observed at plant and insect level;	Field work	BL3-Apply	2
Practical 4	Phenotypic screening techniques for nematodes and borers; Ways of combating them;	Field work	BL3-Apply	2
Practical 5	Evaluating the available populations like RIL, NIL, etc. for pest resistance;	Field work	BL4-Analyze	2
Practical 6	Use of standard MAS procedures. Breeding strategies - Weeds – ecological, environmental impacts on the crops;	Field work	BL4-Analyze	2
Practical 7	Breeding for herbicide resistance;	Field work	BL3-Apply	2
Practical 8	Screening crops for drought and flood resistance; factors to be considered and breeding strategies;	Field work	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Blum, A. (1988). Plant Breeding for Stress Environments. CRC Press. Christiansen, M.N. and Lewis, C.F. (1982). Breeding Plants for Less Favourable Environments. Wiley International. Fritz, R.S., and Simms, E.L. (Eds.). (1992). Plant Resistance to Herbivores and Pathogens: Ecology, Evolution and Genetics. The University of Chicago Press. Li, P.H. and Sakai, A. (1987). Plant Cold Hardiness. Liss, New York Springer Luginpill, P. (1969). Developing Resistant Plants - The Ideal Method of Controlling Insects. USDA, ARS, Washington DC. Maxwell, F.G. and Jennings, P.R. (Eds.). (1980). Breeding Plants Resistant to Insects. John Wiley & Sons. Wiley-Blackwell. Roberto, F. (2018). Plant Breeding for Biotic and Abiotic Stress Tolerance. Springer. Russel, G.E. (1978). Plant Breeding for Pest and Disease Resistance. Butterworths. Sakai, A. and Larcher, W. (1987). Frost Survival in Plants. Springer-Verlag.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	2	-	-	-	-	-	-	-	3	2	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO3	1	-	-	-	3	-	-	-	-	-	-	-	-	-	1
CO4	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
CO5	-	2	-	-	-	1	-	1	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Agricultural Microbiology
Course Code	MICROB- 121[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Biology at secondary level			**Co-Requisite/s**	Agriculture at secondary level			
Course Outcomes & Bloom's Level	**CO1-** Describe various microbe types with emphasis on plant parasitic and beneficial organisms and their significant role in agriculture **(BL1-Remember)** **CO2-** Discuss the growth and reproduction pattern of different agricultural microbes **(BL2-Understand)** **CO3-** Demonstrate the fundamental techniques which are necessary in culturing of the microbes**(BL3-Apply)** **CO4-** Analyse the role of microbes in affecting the productivity of agricultural crops and quality of agriculture produce **(BL4-Analyze)** **CO5-** Evaluate the isolated fungi and bacteria with reference to their potential utilization in enhancing the biotic and abiotic stress in crop plants **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction- Scope of microbiology; brief history of microbiology, Microbial world Prokaryotic and eukaryotic microbes and their differences, Bacteria- Detailed cell structure of bacteria, Phases in bacterial growth, synchronous and diauxic growth.	Interpretive Trails, Critical reading and writing, and, Guided learning and Talks and presentations	3
Unit 2	Microbial Nutrition- Autotrophy-chemoautotrophy, photo autotrophy, heterotrophy. Bacterial genetics- Genetic recombination- transformation, conjugation and transduction plasmids, transposon	Interpretive Trails, Critical reading and writing, and, Guided learning and Talks and presentations	3
Unit 3	Role of microbes in soil fertility and crop production: Carbon cycle. Nitrogen, Phosphorus and Sulphur cycles.	Interpretive Trails, Critical reading and writing, and, Guided learning and Talks and presentations	3
Unit 4	Biological nitrogen fixation symbiotic, associative and asymbiotic, Azolla, blue green algae, Actinorrhizal symbiosis- Frankia. Phosphorus solubilizing microrganisms and mycorrhiza. Rhizosphere and phyllosphere, PGPR microorganisms.	Interpretive Trails, Critical reading and writing, and, Guided learning and Talks and presentations	3
Unit 5	Microbes in human welfare, Types of Fermentation and Fermentation technology, Biofertilizers and silage production technology, Biopesticides-Mode of action, types of biopesticides, Biofuel production and biodegradation-of agrowaste- Gobar gas and composting technology.	Interpretive Trails, Critical reading and writing, and, Guided learning and Talks and presentations	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Study the basics of microbiology laboratory and its equipments	Experiments	BL2-Understand	2
Practical 2	Study the microscope- Parts, principles of microscopy, resolving power and numerical aperture. Study understand the different techniques of sterilization	Experiments	BL2-Understand	2
Practical 3	Study the preparation of different type of solutions and media	Experiments	BL2-Understand	2
Practical 4	Calculate the concentration of different solutions (ppm, percentage, Molarity and Normality)	Experiments	BL2-Understand	2
Practical 5	Preparation of buffers and Estimation of pH	Experiments	BL3-Apply	2
Practical 6	Bacterial staining procedures: Simple staining, Gram's staining and edospore staining	Experiments	BL3-Apply	2
Practical 7	Enumeration of microbial population in soil samples- bacteria, fungi and actinomycetes	Experiments	BL4-Analyze	2
Practical 8	Methods of isolation, purification and maintenance of microbial cultures	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Yadav, R. and Sharma, R. L. 2022. Agricultural Microbiology. Jaya Publishing House.
Articles	NA
References Books	
MOOC Courses	
Videos	NA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	-	-	-	-	-	-	3	-	-
CO2	-	1	-	-	-	-	1	-	-	-	-	1	1	2	-
CO3	1	-	2	-	-	-	2	-	-	-	-	2	-	2	1
CO4	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-
CO5	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Fundamentals of Plant Pathology
Course Code	PP-121[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					1	0	1	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic Biology			**Co-Requisite/s**	Basic Biology			
Course Outcomes & Bloom's Level	**CO1-** Highlighting the scope and objective of plant diseases and its development.**(BL1-Remember)** **CO2-** Interpret about various pathogens including bacteria, fungus, virus and nematodes and their life cycles**(BL2-Understand)** **CO3-** Experimenting concept of disease, causal agents of plant diseases**(BL3-Apply)** **CO4-** Explaining important microorganisms and understand host pathogen interactions**(BL4-Analyze)** **CO5-** Experimenting to analyze and identify the causal organisms of diseases.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction: Importance of plant diseases, scope and objectives of Plant Pathology.History of Plant Pathology with special reference to Indian work.Terms and concepts in Plant Pathology. Disease triangle and tetrahedron and classification of plant diseases. Diseases and symptoms due to abiotic causes.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	9
Unit 2	Fungi: General characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	9
Unit 3	Causes and factors affecting disease development. Important plant pathogenic organisms (different groups): fungi, bacteria, phytoplasma, spiroplasma, viruses, viroids, algae, protozoa and phanerogamic plant parasites with example of diseases caused by them.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	10
Unit 4	Bacteria and mollicutes: General morphological characters. Basic methods of classification and reproduction. Viruses: Nature, architecture, multiplication and transmission and phanerogamic plant parasites with example of diseases caused by them.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	10
Unit 5	Growth and reproduction of plant pathogens. Liberation, dispersal and survival of plant pathogens.Types of parasitism and variability in plant pathogens.Pathogenesis role of enzymes, toxins and growth regulators in disease development.Defence mechanism in plants. Epidemiology: Factors affecting disease development.	Cooperative Learning Strategies (CLS), Brain Storming, Case Studies and Solution based learning	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Acquaintance with various laboratory equipments and microscopy	Experiments	BL2-Understand	2
Practical 2	Sterilization techniques	Experiments	BL2-Understand	2
Practical 3	Preparation of PDA	Experiments	BL3-Apply	2
Practical 4	Isolation of fungal pathogen	Experiments	BL3-Apply	2
Practical 5	Preparation of media, isolation and Kochs	Experiments	BL4-Analyze	2
Practical 6	General study of different structures of fungi	Experiments	BL4-Analyze	2
Practical 7	Study of representative fungal genera	Experiments	BL5-Evaluate	2
Practical 8	Staining and identification of plant pathogenic bacteria	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Sinha, A.K. and Tripathi, D.P. 2011. Fundamentals of Plant Pathology. Kalyani.
Articles	NA
References Books	
MOOC Courses	
Videos	NA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	-	-	-	-	-	-	3	1	-
CO2	-	1	1	2	-	-	-	-	-	-	-	-	-	3	-
CO3	2	-	1	1	-	-	2	-	-	1	2	2	-	-	2
CO4	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-
CO5	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Disease of field and Horticultural crops and Their Management-1
Course Code	PP-311 [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Plant Pathology			**Co-Requisite/s**	Plant Pathology			
Course Outcomes & Bloom's Level	**CO1-** Describe the types of symptoms produced by Fungal, Bacterial, viral and Phytoplasmal pathogens on field and horticultural crops. **(BL1-Remember)** **CO2-** Identify the different types of pathogens and their etiology associated with field and horticultural crops. **(BL2-Understand)** **CO3-** Demonstrate the disease cycle and favourable condition for development of diseases **(BL3-Apply)** **CO4-** Investigate the management practices for major diseases of field and horticultural crops**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Symptoms, etiology, disease cycle and management of following diseases: Rice: Blast, Brown spot, Bacterial blight, Sheath blight, False smut, Khaira and Tungro; Maize: Stalk rots, Downy mildew, Leaf spots; Sorghum: Smuts, Grain mold and Anthracnose, Bajra: Downy mildew and Ergot;	Spot identification, Herberia, ABL and Probllem based learning	6
Unit 2	Symptoms, etiology, disease cycle and management of following diseases: Groundnut: Early and Late leaf spots, Wilt; Soybean: Rhizoctonia blight, Bacterial spot, Seed and seedling rot and Mosaic; Pigeonpea: Phytophthora blight, Wilt and Sterility mosaic; Finger millet: Blast and Leaf spot;	Spot identification, Herberia, ABL and Probllem based learning	6
Unit 3	Symptoms, etiology, disease cycle and management of following diseases: Black & Green gram: Cercospora leaf spot and Anthracnose, Web blight and Yellow mosaic; Castor: Phytophthora blight; Tobacco: Black shank, Black root rot and Mosaic.	Spot identification, Herberia, ABL and Probllem based learning	6
Unit 4	Symptoms, etiology, disease cycle and management of following diseases: Guava: Wilt and Anthracnose; Banana: Panama wilt, Bacterial wilt, Sigatoka and Bunchy top; Papaya: Foot rot, Leaf curl and Mosaic, Ring spot; Pomegranate: Bacterial blight;	Spot identification, Herberia, ABL and Probllem based learning	7
Unit 5	Symptoms, etiology, disease cycle and management of following diseases: Cruciferous vegetables: Alternaria leaf spot and Black rot; Brinjal: Phomopsis blight, Fruit rot and Sclerotinia blight; Tomato: Damping off, Wilt (bacterial and fungal), Early and Late blight, Buck eye rot, Leaf curl and mosaic; Okra: Yellow Vein Mosaic, Powdery Mildew; Beans: Anthracnose and Bacterial blight; Ginger: Soft rot; Colocasia: Phytophthora blight; Coconut: Wilt and Bud rot; Tea: Blister blight; Coffee: Rust	Spot identification, Herberia, ABL and Probllem based learning	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Identification of different equipment and glassware used in Plant Pathology Laboratory	Field work	BL2-Understand	2
Practical 2	Visit to field for diagnosis of different diseases of field crops	Field work	BL3-Apply	2
Practical 3	Visit to field for diagnosis of different diseases of horticultural crops	Field work	BL3-Apply	2
Practical 4	Preparation of different types of media	Experiments	BL3-Apply	2
Practical 5	Isolation of pathogens associated with plant diseases	Experiments	BL3-Apply	2
Practical 7	Cultural and morphological identification of plant pathogens Histo-pathological studies of diseases.	Experiments	BL3-Apply	2
Practical 7	To study about the management practices of diseases.	Field work	BL4-Analyze	2
Practical 8	Collection and preservation of plant diseased specimens for herbarium.	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Rangaswami, G. and Mahadevan, K. 2001. Diseases of crop plants in India. Prentice Hall of India Pvt. Ltd, New Delhi.
Articles	
References Books	Agrios, G. N. (2005). Plant Pathology. 5th Edition. Academic Press University of Florida, Gainesville, U.S.A.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	-	-	-	-	2	-	3	1	-
CO2	-	1	1	1	-	-	-	-	-	-	-	-	-	3	-
CO3	3	-	2	2	2	1	2	-	-	-	2	2	-	-	2
CO4	-	2	-	3	1	2	2	-	-	-	2	1	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Principals of integrated Pest and Disease Management
Course Code	PP-312 [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Plant Pathology			**Co-Requisite/s**	Plant Pathology			
Course Outcomes & Bloom's Level	**CO1-** Describe the basic concepts and principles of integrated pest and diseases management **(BL1-Remember)** **CO2-** Identify the different pest and diseases in crop plants **(BL1-Remember)** **CO3-** Demonstrate the effectiveness of different component of IPDM **(BL1-Remember)** **CO4-** Investigate the occurrence and forecasting of Insect-pests and diseases **(BL1-Remember)** **CO5-** Evaluate the suitability of modules of IPDM in different environmental conditions **(BL1-Remember)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth) SDG12(Responsible consuption and production) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis.	Spot identification, Herberia, ABL and Problem based learning	6
Unit 2	Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.	Spot identification, Herberia, ABL and Problem based learning	6
Unit 3	Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment.	Spot identification, Herberia, ABL and Problem based learning	6
Unit 4	Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases.	Spot identification, Herberia, ABL and Problem based learning	6
Unit 5	Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes	Spot identification, Herberia, ABL and Problem based learning	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	To study about Methods of diagnosis and detection of various insect pests, and plant diseases	Field work	BL2-Understand	2
Practical 2	To study about Methods of insect pests and plant disease measurement	Field work	BL2-Understand	2
Practical 3	To study about Assessment of crop yield losses.	Experiments	BL5-Evaluate	2
Practical 4	To study about Calculations based on economics of IPM	Experiments	BL4-Analyze	2
Practical 5	To study about Identification of biocontrol agents, different predators and natural enemies	Field work	BL3-Apply	2
Practical 6	To study about Mass multiplication of Trichogramma sp	Experiments	BL6-Create	2
Practical 7	To study about Identification and nature of damage of important insect pests and diseases and their management	Experiments	BL4-Analyze	2
Practical 8	Awareness campaign at farmers' fields.	Field work	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Pedigo, L. P. (1991). Entomology and pest management, Prentice Hall of India Pvt. Ltd., New Delhi
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	-	-	-	-	-	-	3	1	-
CO2	-	1	2	2	-	-	-	-	-	-	-	-	-	3	-
CO3	3	-	-	1	2	-	-	-	-	1	2	2	-	-	2
CO4	-	2	-	-	-	-	-	-	-	1	1	1	-	-	-
CO5	-	-	1	2	-	-	1	-	-	2	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Disease of field and Horticultural crops and Their Management-II
Course Code	PP-321[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and field work							
Course Category	Discipline Core							
Pre-Requisite/s	Principles of Integrated Pest and Disease Management			**Co-Requisite/s**	Diseases of Field and Horticultural Crops and their Management -I			
Course Outcomes & Bloom's Level	**CO1-** Describe the types of symptoms produced by Fungal, Bacterial, viral and Phytoplasmal pathogens on field and horticultural crops. **(BL1-Remember)** **CO2-** Identify the different types of pathogens and their etiology associated with field and horticultural crops. **(BL2-Understand)** **CO3-** Demonstrate the disease cycle and favourable condition for development of diseases **(BL3-Apply)** **CO4-** Investigate the management practices for major diseases of field and horticultural crops. **(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Symptoms, etiology, disease cycle and management of following diseases: Wheat: Rusts, Loose smut, Karnal bunt, Powdery mildew, Alternaria blight, and Ear cockle; Sugarcane: Red rot, Smut, Wilt, Grassy shoot, Ratoon stunting and Pokkah Boeng; Sunflower: Sclerotinia stem rot and Alternaria blight;	Spot identification, Herberia, ABL and Probllem based learning	6
Unit 2	Symptoms, etiology, disease cycle and management of following diseases: Mustard: Alternaria blight, White rust, Downey mildew and Sclerotinia stem rot; Gram: Wilt, Grey mould and Ascochyta blight; Lentil: Rust and Wilt; Cotton: Anthracnose, Vascular wilt, and Black arm; Pea: Downy mildew, Powdery mildew and Rust;	Spot identification, Herberia, ABL and Probllem based learning	6
Unit 3	Symptoms, etiology, disease cycle and management of following diseases: Mango: Anthracnose, Malformation, Bacterial blight and Powdery mildew; Citrus: Canker and Gummosis; Grape vine: Downy mildew, Powdery mildew and Anthracnose; Apple: Scab, Powdery mildew, Fire blight and Crown gall; Peach: Leaf curl; Strawberry: Leaf spot	Spot identification, Herberia, ABL and Probllem based learning	6
Unit 4	Symptoms, etiology, disease cycle and management of following diseases: Potato: Early and Late blight, Black scurf, Leaf roll, and Mosaic; Onion and garlic: Purple blotch, and Stemphylium blight; Chillies: Anthracnose and Fruit rot, Wilt and Leaf curl;	Spot identification, Herberia, ABL and Probllem based learning	7
Unit 5	Symptoms, etiology, disease cycle and management of following diseases: Cucurbits: downy mildew, powdery mildew, wilt; Turmeric: leaf spot Coriander: Stem gall Marigold: Botrytis blight; Rose: Dieback, Powdery mildew and Black leaf spot.	Spot identification, Herberia, ABL and Probllem based learning	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Identification of different equipment and glassware use in plant Pathology Laboratory	Experiments	BL2-Understand	2
Practical 2	isit to field for diagnosis of different diseases of field crops	Experiments	BL3-Apply	2
Practical 3	Visit to field for diagnosis of different diseases of horticultural crops.	Field work	BL3-Apply	2
Practical 4	Preparation of different types of media.	Experiments	BL3-Apply	2
Practical 5	Isolation of pathogens associated with plant diseases 10. Cultural and morphological identification of plant pathogens	Experiments	BL4-Analyze	2
Practical 6	Histo-pathological studies of diseases.	Experiments	BL4-Analyze	2
Practical 7	To study about the management practices of diseases.	Experiments	BL4-Analyze	2
Practical 8	Collection and preservation of plant diseased specimens for herbarium.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Rangaswami, G. and Mahadevan, K. (2001). Diseases of crop plants in India, Prentice Hall of India Pvt.Ltd, New Delhi.
Articles	
References Books	George, N.A. (2005). Plant Pathology 5th Edition, Academic Press University of Florida, Gainesville, U.S.A.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	-	-	-	-	2	-	2	1	-
CO2	-	1	1	1	-	-	-	-	-	-	-	-	1	3	-
CO3	3	-	2	2	2	1	2	-	-	-	2	-2	-	-	2
CO4	-	2	-	3	1	2	2	-	-	-	2	-1	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Agronomy

Title of the Course	Soil Fertility and Fertilizer Use
Course Code	SOILS-502 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Soil fertility and fertilizer use			**Co-Requisite/s**	Soil fertility and fertilizer use			
Course Outcomes & Bloom's Level	**CO1-** Describe essential plant nutrients, its functions and deficiency symptoms. **(BL1-Remember)** **CO2-** Discuss sources, forms, roles and transformation of nitrogen in soil. **(BL2-Understand)** **CO3-** Demonstrate the methods of fertilizer recommendation and application **(BL3-Apply)** **CO4-** Analyse the role of phosphatic fertilizer,behavior and their management **(BL4-Analyze)** **CO5-** Justify the significance for presence of potassium and sulphur in soil. **(BL5-Evaluate)** **CO6-** Justify the significance for presence of potassium and sulphur in soil. **(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Soil fertility and soil productivity; nutrient sources fertilizers and manures; essential plant nutrients - functions and deficiency symptoms.	Brain storming, Guided learning, Cooperative Learning Strategies	5
Unit-2	Soil and fertilizer nitrogen sources, forms, immobilization and mineralization, nitrification, denitrification; biological nitrogen fixation - types, mechanism, microorganisms and factors affecting; nitrogenous fertilizers and their fate in soils; management of fertilizer nitrogen in lowland and upland conditions for high fertilizer use efficiency.	Brain storming, Guided learning, Cooperative Learning Strategies Lab work	5
Unit-3	Soil and fertilizer phosphorus - forms, immobilization, mineralization, reactions in acid and alkali soils; factors affecting phosphorus availability in soils; phosphatic fertilizers - behavior in soils and management under field conditions.	Guided learning, Cooperative Learning Strategies, Lab work,	5
Unit-4	Potassium - forms, equilibrium in soils and its agricultural significance; mechanism of potassium fixation; management of potassium fertilizers under field conditions. Sulphur - source, forms, fertilizers and their behavior in soils; calcium and magnesium factors affecting their availability in soils; management of sulphur, calcium and magnesium fertilizers.	Cooperative Learning Strategies, Lab work, Fieldwork and outdoor learning Problem-based learning	5
Unit-5	Micronutrients critical limits in soils and plants; factors affecting their availability and correction of their deficiencies in plants; role of chelates in nutrient availability. Common soil test methods for fertilizer recommendations; quantity intensity relationships; soil test crop response correlations and response functions.	Lab work, Fieldwork and outdoor learning Problem-based learning ,Discussions and Presentation, ABL	6
Unit-6	Fertilizer use efficiency; blanket fertilizer recommendations usefulness and limitations; site-specific nutrient management; plant need based nutrient management; integrated nutrient management. Soil fertility evaluation - biological methods, soil, plant and tissue tests; soil quality in relation to sustainable agriculture.	Brainstorming, Fieldwork and outdoor learning, Critical incidents	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Principles of colorimetric	Experiments	BL2-Understand	2
Practical 2	Flame-photometry and atomic absorption spectroscopy	Experiments	BL3-Apply	2
Practical 3	Chemical analysis of soil for total and available nutrients	Experiments	BL3-Apply	2
Practical 4	Analysis of plants for essential elements	Experiments	BL3-Apply	2
Practical 5	Study of PH	Field work	BL4-Analyze	2
Practical 6	Study of EC	Experiments	BL5-Evaluate	2
Practical 7	Study of N, P and K	Experiments	BL6-Create	2
Practical 8	Study of gypsum	Experiments	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10	0		0	

Part E

Books	Brady, N. C. and Weil, R. R. (2002). The Nature and Properties of Soils. 13th Ed. Pearson Edu.Kabata, P. A. and Pendias, H. (1992). Trace Elements in Soils and Plants. CRC Press. Kannaiyan, S., Kumar, K. and Govindarajan, K. (2004). Biofertilizers Technology. Scientific Publ.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	-	-	-	-	-	-	-	-	-	-	3	1	-
CO2	-	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2
CO4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Agronomy

Title of the Course	Soil Chemistry
Course Code	SOILS-503[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Agronomy, lab knowledge and soil concepts			**Co-Requisite/s**	Agronomy			
Course Outcomes & Bloom's Level	**CO1-** Understand the chemical (elemental) composition of the earth's crust, soils, rocks, and minerals and Learn the basics of chemical kinetics and its application in soil chemistry. **(BL1-Remember)** **CO2-** Analyze the properties of soil colloids, including inorganic and organic colloids and understand the origin of charge in soil colloids and the concept of zero point charge (ZPC) **(BL2-Understand)** **CO3-** Understand ion exchange processes in soil, focusing on cation exchange theories based on the law of mass action (Kerr-Vanselow, Gapon equations, hysteresis, Jenny's concept)**(BL3-Apply)** **CO4-** Learn about the quantity/intensity (Q/I) relationship and the concepts of step and constant-rate K. Understand the management aspects related to soil chemistry and nutrient fixation.**(BL4-Analyze)** **CO5-** Study the chemistry of acid soils, including active and potential acidity and lime potential and the geochemistry of micronutrients and environmental soil chemistry**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG7(Affordable and clean energy) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	organic matter - fractionation of soil organic matter and different fractions, clay-organic interactions. Elements of equilibrium thermodynamics, chemical equilibria, electrochemistry and chemical kinetics. Experimental methods to study ion exchange phenomena and practical implications in plant nutrition.	Brain storming, Guided learning, Cooperative Learning Strategies	6
Unit-2	Soil colloids: inorganic and organic colloids - origin of charge, concept of Point of Zero Charge (PZC) and its dependence on variable-charge soil components, surface charge characteristics of soils; diffuse double layer theories of soil colloids, zeta potential, stability, coagulation/flocculation and peptization of soil colloids; electrometric properties of soil colloids; sorption properties of soil colloids	Brain storming, Lab work , Critical incidents, Fieldwork and outdoor learning	6
Unit-3	Ion exchange processes in soil; cation exchange- theories based on law of mass action (Kerr- concept), adsorption isotherms, donnan-membrane equilibrium concept, clay-membrane electrodes and ionic activity measurement, thermodynamics, statistical mechanics; anion and ligand exchange innersphere and outer-sphere surface complex formation, fixation of oxyanions, hysteresis in sorption-desorption of oxy-anions and anions, shift of PZC on ligand exchange, AEC, CEC;	Brain storming, Lab work , Fieldwork and outdoor learning	6
Unit-4	Potassium, phosphate and ammonium fixation in soils covering specific and non-specific sorption; precipitation-dissolution equilibria; step and constant-rate K; management aspects	Brain storming,lab work, Fieldwork and outdoor learning, Talks and presentations	7
Unit-5	Chemistry of acid soils; active and potential acidity; lime potential, chemistry of acid soils; sub-soil acidity Chemistry of salt-affected soils and amendments; soil pH, ECe, ESP, SAR and important relations; soil management and amendments. Chemistry and electrochemistry of submerged soils.	Brain storming, Critical incidents, lab work, Talks and presentations	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unti-1	1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil.	Experiments	BL2-Understand	2
Unti-2	1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil.	Field work	BL2-Understand	2
Unti-3	1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil.	Field work	BL3-Apply	2
Unti-4	1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil. 1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil.	Field work	BL3-Apply	2
Unti-5	1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil.	Experiments	BL3-Apply	2
Unti-6	1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil.	Experiments	BL4-Analyze	2
Unti-7	1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil.	Field work	BL4-Analyze	2
Unti-8	1. Determination of CEC and AEC of soils, 2. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, 3. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, 4. Potentiometric and conductometric titration of soil humic and fulvic acids, (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Construction of adsorption envelope of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil.	Field work	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10	0		0	

Part E

Books	Bear, R. E. (1964). Chemistry of the Soil. Oxford and IBH.
Articles	Bolt, G. H. & Bruggenwert, M. G. M. (1978). Soil Chemistry. Elsevier.
References Books	Stevenson, F. J. (1994). Humus Chemistry. 2nd Ed. John Wiley & Sons.
MOOC Courses	
Videos	Van, O. H. (1977). Introduction to Clay Colloid Chemistry. John Wiley & Sons.

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	-	-	-	-	-	-	-	-	-	-	3	1	-
CO2	-	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2
CO4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Problematic Soils and their Management
Course Code	SS- 221[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Fundamentals of Soil Science			**Co-Requisite/s**	Soil and Water Conservation Engineering			
Course Outcomes & Bloom's Level	**CO1-** Describe the current scenario of problematic soils in India. **(BL2-Understand)** **CO2-** Illustrate the processes responsible for the formation of problematic soils **(BL2-Understand)** **CO3-** CO-3 Apply remote sensing and GIS techniques for identification, diagnosis and management of problematic soils. **(BL3-Apply)** **CO4-** Analyse the quality of irrigation water and soil health and its suitability for use in various crops **(BL4-Analyze)** **CO5-** Assess the effects of various reclamation strategies in management of problematic soils **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.	Guided Learning, ABL, Problem-based learning and Brainstorming	6
Unit 2	Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.	Guided Learning, ABL, Problem-based learning and Brainstorming	6
Unit 3	Irrigation water quality and standards, utilization of saline and brackish water in agriculture.	Guided Learning, ABL, Problem-based learning and Brainstorming	6
Unit 4	Remote sensing and GIS in diagnosis and management of problem soils.	Guided Learning, ABL, Problem-based learning and Brainstorming	7
Unit 5	Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.	Guided Learning, ABL, Problem-based learning and Brainstorming	7

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	41	50		50	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0		0	

Part E

Books	Das, D.K. (2019). Problematic Soils & Their Management. Kalyani Publishers.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	2	-	-	-	-	-	3	1	-
CO2	-	1	1	-	-	-	1	-	-	-	-	1	1	2	-
CO3	2	2	2	1	2	-	2	-	-	-	-	2	-	-	1
CO4	-	-	-	2	-	-	-	-	-	-	-	1	-	1	-
CO5	-	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Fundamental of Soil Science
Course Code	SS-111[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Science at secondary level.			**Co-Requisite/s**	Agriculture at secondary level.			
Course Outcomes & Bloom's Level	**CO1-** Describe the basic concepts and principles of Soil Science **(BL1-Remember)** **CO2-** Explain the behaviour of various soils in relation to crop production and management **(BL2-Understand)** **CO3-** Demonstrate various soil physical, chemical and biological properties and their impact on plant growth **(BL3-Apply)** **CO4-** Examine the soil pollution and its prevention **(BL4-Analyze)** **CO5-** Evaluate the harmful effects of various agrochemicals on soil health **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation	Guided Learning, Fieldwork, Problem-based learning and Brainstorming	6
Unit 2	Soil Profile, components of soil; Soil physical properties: soiltexture, structure, density and porosity, soil colour, consistence and plasticity	Guided Learning, Fieldwork, Problem-based learning and Brainstorming	6
Unit 3	Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth	Guided Learning, Fieldwork, Problem-based learning and Brainstorming	6
Unit 4	Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation.	Guided Learning, Fieldwork, Problem-based learning and Brainstorming	7
Unit 5	Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro-organisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution	Guided Learning, Fieldwork, Problem-based learning and Brainstorming	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Study of soil profile in field.	Field work	BL2-Understand	2
Practical 2	Study of soil sampling tools, collection of representative soil sample, its processing and storage	Field work	BL2-Understand	2
Practical 3	Determination of soil colour	Experiments	BL3-Apply	2
Practical 4	Determination of soil pH and electrical conductivity	Experiments	BL3-Apply	2
Practical 5	Determination of soil texture by feel and Bouyoucos Methods.	Experiments	BL3-Apply	2
Practical 6	Determination of Bulk density & Particle density	Experiments	BL3-Apply	2
Practical 7	Determination of moisture content and porosity	Experiments	BL3-Apply	2
Practical 8	Determination of soil organic carbon	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Sahai, V.N. (2016). Fundamental of soil science. Kalyani Publishers.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	1	-	1	-	-	-	-	-	3	1	-
CO2	1	1	1	-	-	-	1	-	-	-	-	1	1	2	-
CO3	-	1	2	-	1	-	1	-	-	-	-	1	-	-	1
CO4	-	-	-	1	-	-	-	-	-	-	-	2	-	1	-
CO5	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_HonsAgriculture

Title of the Course	Manures, Fertilizers and Soil Fertility Management
Course Code	SS-311 [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Fundamentals of Soil science			**Co-Requisite/s**	Problematic soil and their management			
Course Outcomes & Bloom's Level	**CO1-** Describe different types of manures and fertilizers**(BL1-Remember)** **CO2-** Understand the use of different types of manures and fertilizers in soil fertility management**(BL2-Understand)** **CO3-** Estimate the content of major essential plant nutrients in soil and plant samples**(BL3-Apply)** **CO4-** Examine the deficiency and toxicity symptoms of essential plant nutrients**(BL4-Analyze)** **CO5-** Justify the role of integrated nutrient management practices in maintaining the soil health in sustainable manner**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.	case Study, Guided Learning and Brain Storming	6
Unit-2	Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.	case Study, Guided Learning and Brain Storming	6
Unit-3	History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.	case Study, Guided Learning and Brain Storming	6
Unit-4	Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil.	case Study, Guided Learning and Brain Storming	7
Unit-5	Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.	case Study, Guided Learning and Brain Storming	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry.	Experiments	BL2-Understand	2
Practical 2	Estimation of soil organic carbon	Experiments	BL3-Apply	2
Practical 3	Estimation of alkaline hydrolysable N in soils.	Experiments	BL4-Analyze	2
Practical 4	Estimation of soil extractable P in soils	Experiments	BL5-Evaluate	2
Practical 5	Estimation of exchangeable K; Ca and Mg in soils.	Experiments	BL4-Analyze	2
Practical 6	Estimation of soil extractable S in soils	Experiments	BL5-Evaluate	2
Practical 7	Estimation of DTPA extractable Zn in soils.	Experiments	BL5-Evaluate	2
Practical 8	Estimation of N in plants.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
80	31	50		30	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
20	10				

Part E

Books	Gupta, P.K. (1999) Hand book of Soil, Fertilizer and Manure. Agro Botanica, Bikaner Singh,S.S.2011.Soil Fertility andNutrient Management.3rd Edn. Kalyani Publishers.New Delhi
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO4	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_Agriculture-Horticulture_Vegetable_Science

Title of the Course	Organic Vegetable Production
Course Code	VSC-511[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Define basic concept of organic inputs.**(BL1-Remember)** **CO2-** Outline soil fertility management in organic vegetable production.**(BL2-Understand)** **CO3-** Apply concept of biodynamic and EM technology in organic vegetable production.**(BL3-Apply)** **CO4-** Analyze plant protection measures in organic vegetable production.**(BL4-Analyze)** **CO5-** Evaluate certification process and quality control.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
1	Importance and principles—Importance, principles, perspective, concepts and components of organic farming in vegetable crops	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming	2
2	Organic production of vegetables—Organic production of vegetable crops, viz., Solanaceous, Cucurbitaceous, Cole, root and tuber crops	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming	2
3	Managing soil fertility—Managing soil fertility, mulching, raising green manure crops, weed management in organic farming system; Crop rotation in organic production; Processing and quality control of organic vegetable produce	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming	2
4	Composting methods—Indigenous methods of composting, Panchyagavvya, Biodynamics preparations and their application; ITKs in organic vegetable farming; Role of botanicals and bio-control agents in the management of pests and diseases in vegetable crops	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming	2
5	Certification and export—Techniques of natural vegetable farming, GAP and GMP certification of organic products; Export- opportunity and challenges	Guided learning Fieldwork and outdoor learning Cooperative Learning Strategies Brainstorming	2

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Practical 1	Methods of preparation and use of compost, vermicompost, biofertilizers and biopesticides	PBL		
Practical 2	Soil solarisation	PBL		
Practical 3	Use of green manures	PBL		
Practical 4	Waste management; Organic soil amendments in organic production of vegetable crops	PBL		
Practical 5	Weed, pest and disease management in organic vegetable production	PBL		
Practical 6	Visit to organic fields and marketing centres	PBL		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	41	50		50	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	Dahama AK. 2005. Organic Farming for Sustainable Agriculture. 2nd Ed.Agrobios. Gehlot G. 2005. Organic Farming; Standards, Accreditation Certificationand Inspection. Agrobios. Palaniappan SP &Annadorai K. 2003. Organic Farming, Theory andPractice. Scientific Publ. Pradeepkumar T, Suma B, Jyothibhaskar&Satheesan KN. 2008.Management of Horticultural Crops. New India Publ. Agency. Shivashankar K. 1997. Food Security in Harmony with Nature. 3rd IFOAMASIA,Scientific Conf.. 1- 4 December, 1997, UAS, Bangalore.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	2	2	-	-	-	-	-	2	-	-	-
CO3	2	-	1	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	1	-	-	1	-	-	-	-	-	1	-	-	-
CO5	1	1	-	-	1	1	1	-	-	1	-	1	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-