

SHRI GURU RAM RAI UNIVERSITY



**SCHOOL OF
AGRICULTURAL SCIENCES**

**PO,CO,PSO
AND
PEO BOOKLET**



SHRI GURU RAM RAI UNIVERSITY

Become an expert
in agriculture science





Shri Guru Ram Rai University

(Estd. By Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act No. 03 of 2017 Act No. 03 of July 2017)

Pathribagh, Dehradun-248001, Uttarakhand

SCHOOL OF AGRICULTURAL SCIENCES

B.Sc. (Hons.) Agriculture

Program outcome (POs)

PO1	In depth understanding of operational aspects, principles and objectives of Agriculture and Allied Sciences.
PO2	Demonstrate the professional agricultural solutions in societal and environmental contexts, with the knowledge and need for sustainable development.
PO3	Critical thinking and problem solving skills to understand the importance of crop production and animal husbandry.
PO4	Use of research based knowledge in collection, presentation of data, analysis of results of experiments in laboratories and fields for their validation
PO5.	Creation and selection of different technologies for agricultural purposes
PO 6	Application of contextual knowledge of agricultural farming for societal purposes
PO 7	Understand and evaluate ethical environment issues related to agricultural farming.
PO8	Follow professional ethics and responsibilities and norms of agricultural subjects while practicing.
PO9	Demonstrate and ability to engage in analyzing situations and constructing viable solutions to work effectively with each other.
PO10	Develop an understanding of communication methods, resources utilization, cultivation, management of crops, and value addition of agricultural produces
PO11	Motivate for entrepreneurship, start-up through project planning and execution, research and training during field visits etc.
PO12	Generate a culture of life-long learning in an inclined environment to achieve personal and enhance their employability for jobs in different sectors

Course Outcome (Cos)

Course Code	Course Title	Course Outcome
Upon successful completion of the course a student will be able to		
BSAC-101	Fundamental of Horticulture	CO1. Memorize the concept of horticulture, classification and its' scope. CO2. Understands basic principles, processes and plant propagation methods. CO3. Determine techniques to propagate, manage and harvest plants CO4. Assess and correlate knowledge of horticulture to the economy and environment CO5. Evaluate importance of growth regulators CO6. Prepare nursery beds
BSAC-102	Fundamentals of Plant Biochemistry and Biotechnology	CO1. Memorize basic terminology of biochemistry. CO2. Understand the structure and functions of Biomolecules and their metabolic processes CO3. Apply the instruments, techniques required for work in biotechnological and biochemistry laboratories. CO4. Enhance the skill of plant tissue culture and basics of genetic engineering and its application in Agriculture. CO5. Analyse importance of crop improvement CO6. Prepare stock solution of media
BSAC-103	Fundamentals of Soil Science	CO1. Memorizing the basic concept of soil forming process and factors in various climatic conditions. CO2. Categorising the physical properties and chemical properties that affect both plant growth and biological activity CO3. Examine the soil condition, moisture, and soil quality and soil health in relation to plant growth. CO4. Able to analyse physical and chemical properties of soil. CO5. Assess soil moisture content CO6. Solve the on farm problems

BSAC-104	Introduction to Forestry	<p>CO1. Memorize and retrieving silviculture terminology, classification and various techniques used in the management of forest resources and production of forest products</p> <p>CO2. Understand to develop and evaluate management plans with multiple objectives and constraints</p> <p>CO3. Develop and apply silvicultural prescriptions appropriate to management objectives</p> <p>CO4. Analyze and design forest inventory information and project for future forest, stand, and tree conditions.</p> <p>CO5. Judge growth habit of trees</p> <p>CO6. Prepare tree nursery layout</p>
BSAC-105	Comprehension & Communication Skills in English	<p>CO1. Identify and explain their aims and objectives of communication, misconceptions about communication and the reasons, people use language.</p> <p>CO2. Differentiate the action, interaction and transaction models of communication process, importance of listening effectively and can identify strategies for communicating the cultural awareness.</p> <p>CO3. Analyze basic communication skills, intercultural communication skills, Interpersonal communication skills and public- speaking skills.</p> <p>CO4. Demonstrate critical and innovative thinking. Display competence in oral, written and visual communication.</p> <p>CO5. Edit the script</p> <p>CO6. Write articles, synopsis and presentations</p>
BSAC-106	Fundamentals of Agronomy	<p>CO1. Recall about basic aspects of Agronomy from sowing up to harvest including various tools and implements used for field operations.</p> <p>CO2. Understand the concept of Crop nutrition, soil-plant-water relationship, crop water requirement</p> <p>CO3. Aware about the principles and methods of irrigation and its application in field crops, Weeds and its management, herbicides, allelopathy.</p> <p>CO4. Assess about Growth and development of crops and their management , harvesting and threshing technologies of crops</p> <p>CO5. Detect weed infestation</p> <p>CO6. Solve Numerical exercises on fertilizer requirement, plant population ,herbicides and water requirement</p>

BSA R-107	Introductory Biology	CO1. Memorize the primary biological functions, basic structure of root, shoot stem. CO2. Summarize the biological principles like binomial nomenclature and classification of cell. CO3. Apply the basic biological techniques like slide preparation, floral morphology, and can categorize the root, shoot and leaf anatomy. CO4. Categorization of families of angiosperm by understanding of difference between the families. CO5. Judge morphological maturity in plants CO6. Prepare specimens slides, herbarium
BSAR-108	Elementary Mathematics	CO1. Recall the areas that comprise the core of the mathematics major CO2. Demonstrate the ability to understand and write mathematical proofs CO3. Use appropriate technologies to solve mathematical problems CO4. Construct appropriate mathematical models to solve a variety of practical problems CO5. Assess Equation of circle CO6. Construct appropriate mathematical models to solve a variety of practical problems
BSAR-109	Agricultural Heritage	CO1. Label get the basic knowledge of various agricultural crops CO2. Understand the knowledge of agricultural heritage in India CO3. Explain traditional crop production and protection techniques CO4. Appraise the present scenario of Indian agriculture CO5. Judge problems and prospects of Indian Agriculture based on agroclimatic condition CO6. Solve the on farm problems of farmers
BSAC-110	Rural Sociology & Educational Psychology	CO1. Describe the concept of sociology and rural sociology, its importance in agricultural extension, characteristics of Indian rural society. CO2. Explain social groups, social stratification, culture, social values, social control and attitudes, leadership and training. CO3. Analyse the concept of educational psychology and behaviour. CO4. Acquaint with characteristics of rural society, village institutions and social organizations. CO5. Judge Cognitive, affective, Personality behaviour CO6. Discuss about socioeconomic condition of rural and urban area

BSAN-111	Human Values & Ethics	<p>CO1. Understand the concept and importance of values and ethics and begin to apply them in their daily lives, personal and professional life and in careers for overall personality development.</p> <p>CO2. Acquaint with principles of philosophy, the acquisition of physical assets and decision making.</p> <p>CO3. Explain the personal and professional lives, self- satisfaction, self -motivation and respect.</p> <p>CO4. Apply the knowledge of positive spirit, soul, Spirituality Quotient and Examination</p> <p>CO5. Evaluate Attachment and Detachment theory</p> <p>CO6. Solve Case Study of Ethical Lives</p>
BSA N-112	NSS	<p>CO1. Memorize importance of youth leadership and activities of NSS</p> <p>CO2. Understand the constitution, citizenship and human right/health care</p> <p>CO3. Explain the activities related to skill development</p> <p>CO4. Collection, analysis, documentation and data reporting of NSS</p> <p>CO5. Evaluate Resource mobilisation</p> <p>CO6. Write a project proposal of self-fund Units(SFUs) and its establishment</p>
BSA N-113	NCC	<p>CO1. Memorize aims, objectives, organization of NCC and NCC song</p> <p>CO2. Judging distance, description of ground and indication of landmarks</p> <p>CO3. Categorise Types of communication, media, latest trends and developments.</p> <p>CO4. Explain Nuclear, Chemical and Biological Warfare</p> <p>CO5. Judging distance. Description of ground and indication of landmarks.</p> <p>CO6. Develop communication, media, and latest trends.</p>
BSAN-114	Physical Education & Yoga Practices	<p>CO1. Remember Meaning, Scope and importance of Physical Education</p> <p>CO2. Summarize Physical Fitness and Health Education</p> <p>CO3. Categorize yoga asana.</p> <p>CO4. Construct and laying out of the track and field</p> <p>CO5. Demonstrate practice of the skills and correction</p> <p>CO6. Construct and laying out of the track and field</p>

BSAC-201	Fundamentals of Genetics	<p>CO1. Describe comprehensive and detailed knowledge of the chemical basis of and variability especially in crop plants to improve and develop the new varieties of plants heredity.</p> <p>CO2. Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.</p> <p>CO3. Design and execute the results of genetic experimentation in plant systems.</p> <p>CO4. Analyze the role of genetic technologies in industries related to Agriculture, biotechnology, pharmaceuticals, and other fields.</p> <p>CO5. Judge Methods of inducing mutations & CIB technique, mutagenic agents</p> <p>CO6. Design and execute the results of genetic experimentation in plant systems</p>
BSAC-202	Agricultural Microbiology	<p>CO1. Identify the basic microbial structure, function and study the comparative characteristics of prokaryotes and eukaryotes</p> <p>CO2. Understand the various Physical and Chemical growth requirements of bacteria</p> <p>CO3. Apply knowledge about production of beneficial bacteria</p> <p>CO4. Explain applications of microbes in human welfare</p> <p>CO5. Detect the ubiquitous nature of microbes inhabiting wide range of ecological habitats</p> <p>CO6. Use microbes in enriching specific plant nutrients</p>
BSAC-203	Soil and Water Conservation Engineering	<p>CO1. Memorizes the soil and water conservation and its importance.</p> <p>CO2. Understand about soil erosion and its types, and its measurement techniques.</p> <p>CO3. Illustrates about different principles and methods of erosion control</p> <p>CO4. Evaluate about wind erosion, mechanics and principles of wind erosion and its control measures</p> <p>CO5. Interpret case studies related to soil and water conservation</p> <p>CO6. Design of graded bunds, contour bunds, grasses bunds</p>

BSAC-204	Fundamentals of Crop Physiology	<p>CO1. Describe the knowledge of physiological phenomena in plant cell.</p> <p>CO2. Summarize the basic mechanism of various metabolic processes in plants</p> <p>CO3. Develop skills in preparation of temporary slides for morphological study of plant</p> <p>CO4. Envelope the ability to categorize the C3, C4, and CAM plants and to understand the importance and application of growth regulators in Agriculture.</p> <p>CO5. Explaining nutrient deficiencies and physiological requirements of the plants.</p> <p>CO6. Design experiments based on growth regulators</p>
BSAC-205	Fundamentals of Agricultural Economics	<p>CO1. Retrieve different aspects of agricultural economics, laws and theory of economics in relation to agricultural economics.</p> <p>CO2. Understand about drought, its types and effect of water deficit on physio-morphological characteristics of the plants.</p> <p>CO3. Analyze peer-reviewed journal articles, literature, and practices that reflect other policies and uplifting approaches for developments of agricultural economics in India.</p> <p>CO4. Explain concept of finance, banking, taxation, economic systems and its role in agricultural economic development.</p> <p>CO5. Interpret market structures responsible for creating national income</p> <p>CO6. Plan Agro economic growth and develop policies</p>
BSAC-206	Fundamentals of Plant Pathology	<p>CO1. Introduce plant pathology (definitions, objective, concept, scope and importance) and role the microorganism to cause disease in plant, pathogenesis and epidemiology.</p> <p>CO2. Discuss the general characters, somatic structures, reproduction, nomenclature, classification of fungi and bacteria.</p> <p>CO3. Identify the disease based on symptoms and applied the management strategies for the control of plant disease.</p> <p>CO4. Acquaint with various laboratory equipment and their uses in plant pathology</p> <p>CO5. Evaluate disease cycle, physiology of pathogen and plant defence</p> <p>CO6. Develop strategies for disease management and controlling pathogens</p>
BSAC-207	Fundamentals of Entomology	<p>CO1. Understand external morphology of insects</p> <p>CO2. Compare the effects of biotic and abiotic factors on life cycle and population dynamics of insects</p> <p>CO3. Demonstrate the concept of pest and IPM</p> <p>CO4. Acquaint with modern methods of pest management and categories the main orders of insects</p> <p>CO5. Evaluate strategies of IPM and controlling pathogens</p>

		CO6. Solve actual insect-pest management problems
BSAC-208	Fundamentals of Agricultural Extension Education	<p>CO1. Develop the concept of Extension Education, scope and process; objectives and Its principles.</p> <p>CO2. Familiarized with Extension systems in India: pre-independence, post-independence era, various extension/ agriculture development programs launched by ICAR/ Govt. of India</p> <p>CO3. Explain Rural Development and Community Development, various development programs launched by Government of India.</p> <p>CO4. Acquaint with ICT Applications in TOT, media mix strategies, Agriculture journalism</p> <p>CO5. Assess various aids of communication</p> <p>CO6. Prepare viable bankable projects</p>
BSAC-209	Communication Skills and Personality Development	<p>CO1. Learn about structural and functional grammar; meaning and process of communication, verbal and nonverbal communication</p> <p>CO2. Make use of knowledge about listening and note taking, writing skills, oral presentation skills</p> <p>CO3. Describe field diary and lab record; indexing, footnote and bibliographic procedures</p> <p>CO4. Organizes reading and comprehension of general and technical articles, precise writing, summarizing and abstracting</p> <p>CO5. Evaluate opportunities to enter into a process that leads to a passion for innovation and development</p> <p>CO6. Become a entrepreneur, on the basis of self-qualities and competencies</p>
BSAC-301	Crop Production Technology – I (<i>Kharif Crops</i>)	<p>CO1. Impart knowledge on various cultivation practices of different Kharif crops</p> <p>CO2. Explain the origin, geographical distribution, economic importance of Kharif crops</p> <p>CO3. Interpret the soil and climatic requirements, varieties of Kharif crops</p> <p>CO4. Evaluate the skills on the cultural practices, yield and weeds of Kharif crops</p> <p>CO5. Evaluate the skills on the cultural practices, yield and weeds of Kharif crops</p> <p>CO6. Solve on farm problems and their management</p>

BSAC-302	Fundamentals of Plant Breeding	<p>CO1. Acquire knowledge of principles and objectives of plant breeding.</p> <p>CO2. Demonstrate the ability to know methodologies and applications of the plant breeding employed for self, cross and vegetative propagated crops.</p> <p>CO3. Apply knowledge for social, economic, environmental ethical, health and safety issues and sustainability with due ethical responsibility.</p> <p>CO4. Summarizes academic environment and make them aware of excellence, develop the urge of creativity, inventiveness, leadership, and the life-long learning.</p> <p>CO5. Realize the necessity of protecting farmers and breeder's right</p> <p>CO6. Designs used in plant breeding experiments, analysis of Randomized Block Design</p>
BSAC-303	Agricultural Finance and Cooperation	<p>CO1. Identify the different credit needs and its role in Indian agriculture, credit analysis, sources of agricultural finance.</p> <p>CO2. Understand how the commercial banks are working, functioning the RRB's, KCC and lead bank scheme, preparing the income statements, balance sheets and Credit Guarantee project proposal</p> <p>CO3. Build knowledge about higher financing institutions, world bank, Insurance and Corporation of India and recent development in agricultural credit.</p> <p>CO4. Familiarize the different cooperatives development in India and its role in rural development</p> <p>CO5. Evaluate significance of cooperatives in Indian agriculture.</p> <p>CO6. Preparation and analysis of financial statements–Balance Sheet and Income Statement.</p>
BSAC-304	Agri- Informatics	<p>CO1. Get to know about basics of agricultural informatics software and applications</p> <p>CO2. Demonstrate MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions</p> <p>CO3. Describe knowledge about Database, concepts and types, uses of DBMS in Agriculture, World Wide Web</p> <p>CO4. Explain about computer models for understanding plant processes, Preparation of contingent crop-planning using IT tools</p> <p>CO5. Assess IT application for computation of water and nutrient requirement of crops</p> <p>CO6. Preparation of contingent crop planning</p>

BSAC-305	Farm Machinery and Power	CO1. Learn about Various sources of farm power and their uses CO2. Understand working of IC Engines and their uses in modern equipment. CO3. Familiarize with Power transmission system, about various parts of tractors and their mechanism CO4. Explain about primary and secondary tillage implement and Implement used in hill agriculture, agriculture farm for various purposes. CO5. Inspect clutch, transmission, differential and final drive of a tractor CO6. Use different types of sprayer
BSAC-306	Production Technology for Vegetables and Spices	CO1. Define practical knowledge on specialized production techniques of vegetables and spices. CO2. Understand will Importance of vegetables & spices in human nutrition improved and national economy CO3. Assess cultural practices, quality requirement, and techniques used in the production of vegetable crops and spices CO4. Modify managing skill for the challenges and opportunities facing the vegetable industry CO5. Recommend propagation techniques to fruit crops CO6. Design nursery layout, orchard establishment
BSAC-307	Environmental Studies and Disaster Management	CO1. Memorizes about environmental studies and ecosystems CO2. Illustrate biodiversity and its conservation CO3. Acquaint with basic structure of atmosphere and their functions, Current problems, related issues context in solving environmental issues and their management CO4. Appraise with meaning and nature of natural disasters, their types and effects and management. CO5. Evaluate relationship between environment and farming system CO6. Work out case studies in polluted areas
BSAC-308	Statistical Methods	CO1. Acquaintance with some basic concepts in statistics and its use in agriculture CO2. Familiar with some elementary statistical methods of analysis of data and to interpret them. CO3. Represent the graphical data of their analysis CO4. Analysis of data pertaining to attributes and to interpret the results. CO5. Test hypothesis in agricultural experiments CO6. Prepare various statistical Design in agricultural experiments

BSAC-309	Livestock and Poultry Management	<p>CO1. Gain knowledge about the types, classification, production of live stocks and poultry and the importance of animals to the health and well-being of society.</p> <p>CO2. Acquire knowledge on management of live stocks and poultry.</p> <p>CO3. Develop and evaluate animal production and applying scientific and quantitative reasoning to solve real-world challenges.</p> <p>CO4. Explain about types, prevention (including vaccination schedule) and control of important diseases of livestock and poultry</p> <p>CO5. Judging of cattle, buffalo and poultry</p> <p>CO6. Formulate of concentrate mixtures</p>
BSAC-401	Crop Production Technology –II (Rabi Crops)	<p>CO1. Define the Origin, geographical distribution, economic importance of Rabi crops.</p> <p>CO2. Identify soil and climatic requirements, varieties, cultural practices and yield of Rabi crops</p> <p>CO3. Make use about the economic importance of forage, Medicinal and Aromatic crops in present sphere</p> <p>CO4. Explain basic morphological characteristics of Rabi crops</p> <p>CO5. Judge different growth stages of crops and their physiological maturity</p> <p>CO6. Prepare seed bed and layout the experiments</p>
BSAC-402	Production Technology for Ornamental Crops, MAP and Landscaping	<p>CO1. Understand meaning, scope and importance of ornamental, MAPs plants and landscaping.</p> <p>CO2. Articulate different methods of packaging, value addition and processing of <u>ornamental</u> crops and MAPs produce.</p> <p>CO3. Design landscaping in executing planned methodology for gardening</p> <p>CO4. Instruct the students regarding production technology of important flowering and medicinal plants.</p> <p>CO5. Processing and value addition in ornamental crops and MAP</p> <p>CO6. Planning and layout of garden.</p>
BSAC-403	Renewable Energy and Green Technology	<p>CO1. Remember and understand different energy sources and their contribution in the agriculture sector</p> <p>CO2. Understand the bio fuel production and their applications in today's world.</p> <p>CO3. Apply of the application or utilization of these products as bioenergy resources.</p> <p>CO4. Familiarize with different solar energy gadgets and their utilization in different sectors</p> <p>CO5. Evaluate application of solar energy</p> <p>CO6. Device solar energy gadgets.</p>

BSAC-404	Problematic Soils and their Management	<p>CO1. Recall fundamental knowledge to identify problematic soils and associated problems</p> <p>CO2. Demonstrate waste land and problematic soils in India and management of the soils.</p> <p>CO3. Apply the fundamentals of soil science disciplines for the reclamation and management of degraded soils</p> <p>CO4. Evaluate different factors responsible for saline, sodic and acidic soils and their properties.</p> <p>CO5. Judge quality of irrigation water</p> <p>CO6. Remote sensing and GIS in diagnosis and management of problem soils.</p>
BSAC-405	Production Technology for Fruit and Plantation Crops	<p>CO1. Recall importance of different fruit crops and plantation crops.</p> <p>CO2. Assess the utilization of different production technologies for the cultivation of major fruits</p> <p>CO3. Apply production technologies of minor fruits -date, ber, pine apple pomegranate, jack fruit and strawberry</p> <p>CO4. Describe and interpret wide range of plantation crops</p> <p>CO5. Judge physiological maturity and ripening period of fruit crops</p> <p>CO6. Design and layout fruit crop nursery beds</p>
BSAC-406	Principles of Seed Technology	<p>CO1. Knowledge about meaning and significance of seeds and their quality</p> <p>CO2. Categorize seed production principles and techniques</p> <p>CO3. Aware about field and seed standards for quality seed production and get the skills of seed quality testing</p> <p>CO4. Assume about procedure and importance of seed certification and acquire the knowledge of seed processing and storage principles and technique</p> <p>CO5. Evaluate seed quality</p> <p>CO6. Design agricultural experiments for seed production</p>
BSAC-407	Farming System & Sustainable Agriculture	<p>CO1. Remember agricultural methods and traditions around the world.</p> <p>CO2. Aware about the cross-cultural contacts and exchanges that brought the world's people together and aided agricultural progress is anticipated</p> <p>CO3. Analyze the practices that reflect civilizations', agricultural traditions and utilizing resources.</p> <p>CO4. Demonstrate how agricultural experts are working in maintaining enough food supply for the world's population</p> <p>CO5. Recommend system model according to agro climatic condition</p> <p>CO6. Demonstrate how agricultural experts are working in maintaining enough food supply for the world's population</p>

BSAC-408	Agricultural Marketing Trade & Prices	CO1. Define the optimization of resource use and output in agriculture marketing, trades and price CO2. Understand marketing process, functions and increase in farm income CO3. Recognizes role of Government in agricultural marketing such as Public sector institutions, their objectives and functions CO4. Appraise how employer characteristics and decision-making at various levels enhance the success of an agricultural enterprise for better living CO5. Application of principles of comparative advantage of international trade CO6. Computation of marketable and marketed surplus of important commodities
BSAC-409	Introductory Agro-meteorology & Climate Change	CO1. Introduce agro meteorology (definitions, aims, scope and importance) CO2. Understand roles of agrometeorology in agriculture and its relation to other areas of agriculture CO3. Acquaint with recent developments in agrometeorology with historical development of climate change. CO4. Explain weather based agro advisories to sustain crop production utilizing various CO5. Interpret Climate change, climatic variability, global warming, causes of climate change. CO6. Measurement, tabulation and analysis of rain
BSAC-501	Principles of Integrated Pest and Disease Management	CO1. Memorize categories of insect pests and diseases CO2. Discuss types of symptoms during infection by various types of pathogens and the role of weather and disease forecasting before the spread of epidemics. CO3. Illustrate the prevention and control measures during the disease spread, disease cycle CO4. Integrate pest managements in cereal and millet, major oil crops, legumes and other miscellaneous crop, political, social and legal implication of IPM. CO5. Evaluate Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. CO6. Plan & assess preventive strategies (IPM module) and decision making
BSAC-502	Manures, Fertilizers and Soil Fertility Management	CO1. Remember the criteria of essentiality and available forms of nutrients in soils and factors affecting transformation of nutrients in soils and their availability. CO2. Estimate knowledge regarding types of fertilizers and classification in terms of nutrient source. CO3. Acquaint with methods of soil analysis for nutrient contents and fertilizer recommendations, application methods and nutrient use efficiency. CO4. Make decisions on nutrient dose, choice of fertilizers/manures and method of application etc. CO5. Judge deficiency and toxicity symptoms of essential plant nutrients CO6. Prepare bulky and concentrated manures. Green/leaf manuring

BSAC-503	Pests of Crops and Stored Grain and their Management	CO1. Identify nature and type of damage done by different arthropods pests CO2. Explain life stages of major crop pests CO3. Discuss life cycles of different agricultural insect pests CO4. Recommend different pest management techniques to farmers and to manage pests of stored grains CO5. Judge Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain CO6. Determine moisture content of grain
BSAC-504	Diseases of Field and Horticultural Crops and their Management–I	CO1. Memorize causal organism, symptomatology, etiology and epidemiology of the important diseases of field and horticultural crops and their management. CO2. Identification and histo-pathological studies of diseases of field and horticultural crops CO3. Differentiate diseases of cereals and horticultural crops and able to diagnosis the diseases. CO4. Design the prevention and control measures during the disease spread, disease cycle and integrated pest management of horticultural crops CO5. Judge types of diseases in cereals and horticultural crops CO6. Design the prevention and control measures during the disease spread, disease cycle and integrated pest management of horticultural crops
BSAC-505	Crop Improvement-I (<i>Kharif</i> Crops)	CO1. Recognize the concept of Centre of Origin of different species of agriculture and horticultural crops and their wild relatives. CO2. Understand the concept of plant genetic resources their conservation strategies and their utilization in improving genotypes CO3. Explain breeding methods for the improvement of sexually and asexually propagated crop species and modern advances for the development of superior hybrids for yield, quality parameter and for more tolerant to abiotic and biotic condition CO4. Construct the concept of ideal plant type and their utilization in development of climate resilient crops. CO5. Evaluate Hybrid seed production technology in cereals CO6. Prepare Design and Layout of field experiments

BSAC-506	Entrepreneurship Development and Business Communication	CO1. Define basic concept of Entrepreneur, Entrepreneurship Development and analyse the business environment in order to identify business opportunities CO2. Choose the parameters to assess opportunities for new business ideas CO3. Design strategies for successful implementation of ideas CO4. Create possibility of entrepreneurship development and opportunities for agro- entrepreneurship and rural development. CO5. Assess entrepreneurial traits, problem solving skills, managerial skills and achievement motivation CO6. Prepare Project Planning Formulation and reports
BSAC-507	Geo informatics and Nano-technology and Precision Farming	CO1. Define the Precision agriculture, its concepts, techniques and Geo-informatics and their use in Precision Agriculture. CO2. Learn about crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies and application in agriculture CO3. Organize the image processing and interpretation; Global positioning system (GPS), components and its functions CO4. Summarize nanotechnology, concepts and techniques applied in agriculture CO5. Visual and digital interpretation of remote sensing images CO6. Projects formulation and execution related to precision farming.
BSAC-508	Practical Crop Production– I(<i>Kharif</i> crops)	CO1. Acquaint with the knowledge of profitable crop production technology CO2. Understand ruminative crop production techniques and management of insect pests and diseases of crops CO3. Adopt diversified farming system according to available farming situation CO4. Assist to encourage the profitable and sustainable agriculture system CO5. Evaluate modern techniques of crop production CO6. Prepare and design layout of field experiments
BSAC-509	Intellectual Property Rights	CO1. Recall the concept of intellectual property rights. CO2. Outline the knowledge of various international organizations related to IP and their importance CO3. Aware about various Intellectual Property Rights in India and basic knowledge of patent and their significance CO4. Explain about Protection of Plant varieties, Farmer's Rights Act and biodiversity conservation and biodiversity Act and their importance CO5. Interpret Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

		CO6. Prepare projects, manuscripts and research articles based on intellectual property rights
BSAC-601	Rainfed Agriculture & Watershed Management	<p>CO1. Define Rainfed Agriculture and its problems and prospects in India.</p> <p>CO2. Classify the Soil and climatic conditions prevalent in rainfed areas and knowledge about drought, its types and effect of water deficit on physio-morphological characteristics of the plants.</p> <p>CO3. Acquaint with Water harvesting systems and its importance, its techniques, efficient utilization of water through soil and crop management practices Management of crops in rainfed areas.</p> <p>CO4. Determine how agricultural experts are working in the field of watershed Management to increase agricultural production in rainfed areas while maintaining enough food supply.</p> <p>CO5. Interpretation of meteorological data and scheduling of supplemental irrigation</p> <p>CO6. Construction of water harvesting structures.</p>
BSAC-602	Protected Cultivation and Secondary Agriculture	<p>CO1. Knowledge about greenhouse technology, types of green houses and construction of green houses.</p> <p>CO2. Identify Greenhouse equipment, materials of construction for traditional and low cost green houses.</p> <p>CO3. Explain to learn about Irrigation systems used in greenhouses, shade net house in protected cultivation.</p> <p>CO4. Generate to understand the Material handling equipment, principle and working.</p> <p>CO5. Cost estimation and economic analysis</p> <p>CO6. Prepare designs and layout experiments under protected areas</p>
BSAC-603	Diseases of Field and Horticultural Crops and their Management-II	<p>CO1. List the causal organism, etiology and epidemiology and importance of studying the disease cycles</p> <p>CO2. Explain different types of symptoms during infection by various types of pathogens and the role of weather and disease forecasting before the spread of epidemics</p> <p>CO3. Describe prevention and control measures during the disease spread, disease cycle and integrated pest management of horticultural crops</p> <p>CO4. Recognize the diseases through symptoms in field, their proper management as well as identification of causal agents and helpful for setting up agri-clinics, farmer oriented service centre and other agri-enterprises.</p> <p>CO5. Evaluate the methods of site specific disease management</p> <p>CO6. Collection and preservation of plant diseased specimens for herbarium</p>

BSAC-604	Post-harvest Management and Value Addition of Fruits and Vegetables	CO1.Memorize importance and use of processing of fruits and vegetables CO2.Understand the value addition of horticulture crops. CO3.Construct work space, tool and equipment design for post- harvest technology and value addition. CO4.Illustrate the physiological disorders of horticultural crops and perform post -harvest practices CO5. Quality evaluation of products CO6. Value addition of fruits and vegetable crops
BSAC-605	Management of Beneficial Insects	CO1.Identify different species of honey bee CO2.Explain scientifically manage a bee keeping unit CO3.Demonstrate different silk worms and understand their hosts and life cycle CO4.Analyze mulberry silk worm scientifically and manage lac insect CO5. Judge Insect orders bearing predators and parasitoids used in pest control CO6. Establish bee keeping unit
BSAC-606	Crop Improvement-II(<i>Rabi Crops</i>)	CO1.Memorize centre of origin, distribution of species, wild relatives in different crops CO2.Apply plant genetic resources, its utilization and conservation CO3.Evaluate about major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties CO4. Analyze new genetic approaches to achieve a definite ideotype of Rabi crop. CO5. Evaluate about major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties CO6. Prepare Layout of field experiments seed production plots
BSAC-607	Practical Crop Production– II(<i>Rabi crops</i>)	CO1.Acquainted with the knowledge of profitable crop production technology. CO2.Understand the management of insect pests and diseases of crops and helps to adopt diversified farming system according to available farming situation. CO3.Illustrate about preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students CO4.Explain profitable based farming system can we adopted with the help of course content CO5. Judge growth stages of crops with their physiological maturity CO6. Prepare Layout of field experiments of rabi crops.

BSAC-608	Principles of Organic Farming	CO1. Remember principles and practices of organic farming CO2. Explain efficient nutrient use through various source of organic manures, insect, pest, disease and weed management under organic mode of production. CO3. Analyze the harmony within an agro-ecosystem by organic mode of farming. Familiarize with organic certification process and standards of organic products set by various agencies. CO4. Create the socio-economic status of farmers and environmental quality due to adoption of organic production practices CO5. Evaluate organic production system CO6. Preparation of enrich compost, vermicompost, bio-fertilizers/bio- inoculants and their quality analysis
BSAC-609	Farm Management, Production & Resource Economics	CO1. Know the concept farm management, objectives and relationship with other sciences. CO2. Identify use of production, function in decision-making on a farm, factor-product, factor-factor and product relationship CO3. Discuss Farm business analysis: meaning and concept of farm income, profitability and importance of farm planning and budgeting CO4. Reevaluate concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies CO5. Determine least cost combination of inputs CO6. Preparation of farm layout.
BSAC-610	Principles of Food Science and Nutrition	CO1. Define food science, food composition and chemistry water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colors, miscellaneous bioactive, Important reactions. CO2. Classify food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods CO3. Discuss food and nutrition, malnutrition (over and under nutrition), nutritional disorders CO4. Compile new trends in food science and nutrition in maintaining health. CO5. Evaluate New trends in food science and nutrition CO6. Plan balance diets
BSAW-701	Rural Agricultural Work Experience and Agro-industrial Attachment(RAWE&AIA)	CO1. Orientation and campus training of students CO2. Understand the various agricultural interventions during village attachment. CO3. Acquaintance with agro industry and its staff CO4. Preparation, presentation and evaluation of project report CO5. Evaluate Learning business network including outlets of the industry CO6. Preparation, presentation and evaluation of project report

BSAL-801	Experiential Learning Programme(ELP)	CO1. Orientation and campus training of students CO2.Implementation of experiential learning during village and industrial attachment. CO3.Execute and demonstrate the modules in agricultural fields CO4.Preparation, presentation and evaluation of project report CO5. Develop entrepreneurship according to agroclimatic conditions CO6. Preparation, presentation and evaluation of project report
BSAE-410	Agribusiness Management	CO1.Define agribusiness management in the Indian economy, Management structure and definitions, capital management and financial management CO2.Understand classification, types and importance of agro-based industries, different marketing systems. CO3.Analyse different marketing systems, different pricing systems and procedure for setting up a agro based industry CO4.Explain method of making of balance sheets, profit and loss statements CO5. Determine agri-input markets CO6. Preparations of projects and Feasibility reports for agribusiness entrepreneur
BSAE-411	Agrochemicals	CO1.Define agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health and management of agrochemicals for sustainable agriculture CO2.Illustrate the major classes, properties and important herbicides. Fate of herbicides. CO3.Acquaint with organic fungicides and systemic fungicides with their mode of action CO4.Summarize fertilizers and their importance. Fertilizer control order and fertilizer logistics and marketing. CO5. Sampling of fertilizers and pesticides. CO6. Calculate of doses of insecticides to be used
BSAE-412	Commercial Plant Breeding	CO1.Remember the aims and objectives of commercial plant breeding CO2.Summarizes principles and techniques of hybrid seed production and registration CO3.Apply Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of biotechnological tools. CO4.Plan intellectual property rights in commercial plant breeding CO5. Quality seed production of vegetable crops under open and protected environment. CO6. Sampling and analytical procedures for purity testing

BSAE-413	Landscaping	CO1.Memorize landscaping terrace gardening, vertical gardening, garden components, adornments CO2.Understand various planting practices of shrubs, herbaceous perennials and trees CO3.Differentiate climber and creepers: importance, selection, propagation, planting. CO4.Design Bio-aesthetic planning and different landscaping of urban and rural areas. CO5. Selection, propagation, planting schemes, architecture of ornamentals CO6. Lawn establishment and maintenance, layout of formal gardens, informal gardens
BSAE-510	Food Safety and Standards	CO1.Recognizes the food safety, hazards and risks, types of hazards – biological chemical, physical hazards CO2.Demonstrate food storage, product design. hygiene and sanitation CO3.Describe Food Safety Measures and Food Safety Management Tools CO4.Examine food laws and standards Indian and International food regulatory regime CO5. Assessment of surface sanitation by swab/rinse method. CO6. Preparation of plans for Implementation of FSMS-HACCP, ISO: 22000
BSAE-511	Bio pesticides & Bio fertilizers	CO1.Acquaint with the importance of bio-pesticides in present scenario CO2.Educate concept and classification of bio-concepts. CO3.Aware about bio fertilizers, its status and scope. characteristic features of various bacterial bio fertilizers CO4.Explain role of bio-fertilizers in quality parameters of various agricultural products and key role of bio-fertilizer in maintain soil health. CO5. Evaluate Quality control of biopesticides CO6. Mass multiplication and inoculums production of bio fertilizers.
BSAE-512	Protected Cultivation	CO1.Define Protected cultivation- importance and scope, Status of protected cultivation in India and World. CO2.Demonstrate Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, Portrays lights, Automation. CO3.Explain Soil preparation and the irrigation and fustigation management in polyhouse. CO4.Analyze the concept of cultivation of economically important medicinal and aromatic plants, Insect pest and disease management CO5. Raising of seedlings and saplings under protected conditions CO6. Bed preparation and planting of crop for production, Intercultural operations

BSAE-513	Micro-propagation Technologies	<p>CO1.Aware about types of cultures (seed, embryo, organ, callus, cell)</p> <p>CO2.Illustrate stages of micro propagation, axillary bud proliferation</p> <p>CO3.Discuss the concept of organogenesis (callus and direct organ formation), somatic embryogenesis, cell suspension cultures</p> <p>CO4.Analyze production of secondary metabolites, Soma clonal variation, Cryopreservation</p> <p>CO5. Examine Production of secondary metabolites</p> <p>CO6. Preparation of working medium.</p>
BSAE-611	Hi-tech.Horticulture	<p>CO1. Recall nursery management and mechanization; micro propagation of horticultural crops</p> <p>CO2.Demonstrate basic modern field preparation and planting methods, protected cultivation</p> <p>CO3.Acquire knowledge of Micro irrigation systems and its components</p> <p>CO4.Familiarize with different methods and components of precision farming: Remote sensing, Geographical Information System (GIS)</p> <p>CO5. Differentiate Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA),</p> <p>CO6. Apply precision farming in horticultural crops</p>
BSAE-612	Weed Management	<p>CO1.Recognize the importance to control weeds in the crop field to minimize the chances of yield loss without endangering the natural resources for future generation.</p> <p>CO2.Acquainted about different approaches of weed management.</p> <p>CO3.Identify the negative and positive consequences of weeds in agriculture, human life & society and also seeking for efficient tools to manage these unwanted plants.</p> <p>CO4.Apply weed control plans and methods in prominent crops</p> <p>CO5. Evaluate the negative and positive consequences of weeds in agriculture, human life & society and also seeking for efficient tools to manage these unwanted plants</p> <p>CO6. Calculate of herbicide doses and weed control efficiency and weed index</p>
BSAE-613	System Simulation and Agro-advisory	<p>CO1 .Know the system approach for representing soil-plant-atmospheric continuum, system boundaries</p> <p>CO2 .Understand crop models, concepts & techniques, types of crop models, data requirements, relational diagrams</p> <p>CO3 .Analyze potential and achievable crop production- concept and modelling techniques for their estimation.</p> <p>CO4. Explain the weather forecasting, types, methods, tools & techniques</p> <p>CO5. Use of crop simulation model for preparation of Agro-advisory</p> <p>CO6. Prepare crop weather calendars</p>

BSAE-614	Agricultural Journalism	CO1. Define nature and scope of agricultural journalism. CO2 .Understand newspapers and magazines as communication media. CO3. Develop knowledge on types, subject matter, structure of agricultural stories, and gathering agricultural information related to it CO4. Generate writing the story: organizing the material, treatment of the story. CO5. Selecting pictures and artwork for the agricultural stories CO6. Write different types of agricultural stories
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M.Sc. Agriculture

Program Outcome (POs)

PO 1.	Quality education in Agriculture with special reference to Agronomy, Soil Science, Horticulture, Entomology, Plant Pathology and Seed Science and Technology to the solution of Agriculture related issues.
PO 2.	Understanding of analysis of complex on and off farm problems and their solution on sustainable manner.
PO 3.	Skills to select and apply natural resources, modern techniques and IT tools for weather forecasting, soil analysis, pest management and quality seed production of food crops.
PO 4.	The methods of experimental design, analysis of data and their presentation.
PO 5.	Research based knowledge of the environment and recognizes the importance of crop biodiversity in the field to preserve agro-ecosystem
PO 6.	Analytical skills by correlating and integrating viable solution to solve problems with team spirit
PO 7.	Demonstrate and understand the impact of globalization and diversification of agriculture. Extension programmes to disseminate modern technologies for farmer's welfare.
PO 8.	Farm management skills for improvement of socioeconomic condition of farmers.
PO 9.	Skills to recognise and evaluate the relationships between input and outputs, cost: benefit ratio in their agricultural field to make effective decision .The programme will enhance job opportunities and entrepreneurship development.
PO 10.	Self-critical opinion to solve the on farm problems on sustainable basis. The students will generate a culture of lifelong learning in an inclined environment to get personal achievement and professional ethics
PO 11.	Know the recent development, future possibilities in agriculture sector. Provide comprehensive knowledge of agriculture production.
PO 12.	The students will generate a culture of lifelong learning in an inclined environment to get personal achievement and professional ethics.

M.Sc. (Ag.) Agronomy

Programme specific outcome (PSOs)

PSO 1.	To develop the skills of modern concepts in crop production
PSO 2.	To educate the various management strategies developed for the losses by various biotic and abiotic factors
PSO 3.	To disseminate modern agriculture knowledge as basic objective of education
PSO 4.	Develop skills in practical work experiments, equipment and laboratory use along with data collection and their interpretation.

Course code	Course Title	COURSE OUTCOME
Upon successful completion of the course a student will be able to		
MSAC-101	Advances in Soil fertility and Nutrient Management	CO1. Memorize basic concept of soil fertility, plant nutrients and maintenance of soil resources on sustainable basis CO2. Outline and summarize the integrated approach of nutrient management. CO3. Skilled for soil and plant analysis CO4. Analyze nutrients related problems and their solution CO5. Assesses the soil fertility and methods of fertilizer application CO6. Execute and manage the experimental protocol regarding nutrient budgeting for crop production
MSAC-102	Agronomy of Major Cereals and Pulses	CO 1. Gather information regarding cereal and pulse crops in India and worldwide. CO2. Outline and summarize cropping system and cropping pattern. CO3. Analyze the problems and their management during crop cultivation. CO4. Manage cultivation of crops CO5. Evaluate the physiological condition of crops CO6. Create crop experimental design

MSAC-103	Dry land Farming and watershed Management	CO1: Memorize dimensions of dry land in India and their classification. CO2: Acquaint with classification of dry climate and agro climatic zones of India and their characteristics in relation to productivity. CO3: Examine constraints for crop production in dry farming areas. CO4: Estimating drought and Strategies for its management. CO5: Evaluate soil and moisture conservation approaches CO6: Formulate IFS models for dry farming areas
MSAS-104	Statistical Methods and Experimental Designs	CO1. Define the basic concept of statistics, t-test, f-test, hypothesis, sampling etc. CO2. Understand the role of statistics in research experiments. CO3. Choose and prepare experimental designs. CO4. Analyze the results of statistical calculations and their validation CO5: Evaluate the properties of estimators CO6: Plan and Manage field experimental designs
MSAC-201	Agro -meteorology and crop Weather Forecast	CO1. Memories roles of agro meteorology. CO2. Classify meteorological and hydrological factors in relation to agriculture. CO3. Solve the problems based on climatic factors. CO4. Categories of Weather and climate. CO5: Assess the effect of precipitation on crop production CO6: Design crop weather calendar for various agro climatic zones
MSAC-202	Cropping System and Sustainable Agriculture	CO1. Acquainted with the basics of cropping systems. CO2.Build and manage cropping scheme CO3. Calculate cropping intensity, rotation intensity etc. CO4. Analyze site specific problems and their solutions. CO5.Evaluate the factors affecting crop growth analysis. CO6: Formulate advanced concept of crop growth productivity

MSAC-203	Agronomy of Oil Seed, Fiber & Sugar Crops	CO1. Identify and recognize the seeds of oilseed, fiber and sugar crops. CO2. Classify crops according to economic importance. CO3 Prepare cropping scheme. CO4. Practical knowledge of Planning and layout of field experiments. CO5: Assess a nature of farm site and develop a new cropping system with available resources CO6: Construct postharvest management practices and value addition
MSAC-204	Principles and practices of water management	CO1. Memorize basic concept of water management. CO2. Outline and summarize the water resources of India CO3. Display and execute the principles of water management CO4. Manage moisture stress conditions. CO5: Assess the suitable method of irrigation according to crops CO6: Construct ideologies pertaining to water management in problematic soils
MSAE-205	Management of Problematic Soils	CO1. Memorize basic concept of problematic soils. CO2. Outline and summarize salt-affected and acidic soils and their management CO3. Assess and collaborate quality of irrigation water CO4. Analyze different parameters in soil and water like pH, EC, ESP etc. CO5: Assess and collaborate quality of irrigation water CO6: Solve the problems of acidic soils
MSAE-206	Stress Physiology	CO1.Retrieve and recall the basics of stress physiology CO2.Infer and implement the various biotic and abiotic factors responsible for plant stress. CO3.Device and review the techniques to manage practices of stress. CO4. Manage salt affected soil. CO5: Assess cause of stress in crops. CO6: Manage salt affected soil.
MSAE-207	Agronomy of Fodder and Forage Crops	CO1. Retrieve and recall the basics of fodder production. CO2.Summarise the cultivation practices of forage crops. CO3.Device and review different techniques of fodder preservation CO 4.Manage fodder availability during drought period CO5: Grade the forage according to availability and quality CO6: Manage fodder availability during drought period

MSAC-301	Principles and practices of organic farming	CO1-Recognise basic concepts of principles and practices of organic farming CO2. Learn about efficient nutrient use through various source of organic manures, insect, pest, disease and weed management under organic mode of production. CO3. Associate with the harmony within an agro ecosystem by organic mode of farming CO4.Familiarize with organic certification process and standards of organic products set by various agencies CO5:Assesses different sources of organic manure CO6: Solve the problems associated with organic farming
MSAC-302	Modern concept in Crop Production	CO1. Recognize agro-climatic zones of India CO 2.Categorise plant growth indices CO3.Device and review modern concept in crop production CO4.Analyse crop modeling in agronomic system. CO5: Assess the yield loss during crop lodging CO6: Solve the on farm problems associated with crops and soil.
MSAC-303	Principles and practices of weed Management	CO1. Identify and recognize the weeds of all season. CO2. Associate with identification, life cycle & nature and type of damage done by weed. CO3. Analyze the negative and positive consequences of weeds in agriculture, human life. CO4. Judge and categorize weed control methods. CO5: Evaluate different methods of weed control CO6: Formulate integrated weed management practices for different ecosystem
MSAE-304	Agrostology and Agroforestry	CO1.Memorise the basic terms of agrostology and agroforestry CO2.Classify agroforestry system in India CO3.Estimate protein content, calorific value, total biomass CO4.Able to select suitable multipurpose tree species for agroforestry systems CO5: Manage pastures and increase production CO 6: Manage pastures and increase production
MSAE-305	Crop Ecology	CO1.Memorise basic concept of crop ecology. CO2.Develop understanding of geographical distribution of crops CO3.Analyse the biotic and abiotic factors affecting crop growth. CO4.Apply the principles of natural recourse management CO5: Evaluate the cropping system according to climatic condition CO6: Solve the problems associated with crop competition
MSAE-306	Agronomy of Medicinal, Aromatic and Under-Utilized Crops	CO1. Recognize and identify medicinal and aromatic plants CO2. Summarize climate and soil requirement; cultural practices; yield and important constituents of medicinal and aromatic crops; and the nutritional importance, production practices of important Under-utilizes crops. CO3. Classify medicinal and aromatic crops according to botanical characteristics and uses.

		CO4. Analyze the essential oil and other chemical constituents in medicinal and aromatic plants CO5. Evaluate Quality characters in medicinal and aromatic plants CO6. Manage the aromatic crop at farm
MSAC-401	Master's Seminar	CO1. Acquaint with scientific terms, concepts and content preparation, etc. CO2. Outline and summarize presentation. CO3. Present and implement photographs and sketches in power point to give valuable information. CO4. Correlate research proposal or synopsis, report, manuscripts/article and publications. CO5. Debate on the concern topic CO6: Prepare research paper, articles and newsletters
MSAC-402	Master's Thesis Research	CO1. Remember scientific terms of research designing, citation and bibliography. CO2. Summarize ethical dimensions of research work and knowledge to obtain appropriate approval. CO3. Correlate scientific measurements, statistical calculations and analysis of data. CO4. Explain research works, collection, classification, presentation and analysis of data. CO.5: Evaluate the treatments in experiments. CO6: Prepare and Manage experimental fields

M.Sc. (Ag.) Horticulture

Programme Specific Outcome (PSO)

PSO1.	Recall the skills of modern concepts in horticultural crop production.
PSO2.	Educate the various management strategies developed for the losses by various biotic and abiotic factors.
PSO3.	Disseminate modern horticulture knowledge as basic objective of education
PSO4.	Development of Entrepreneurship skill as horticulturists, handling large scale production of varieties of horticultural crops.

Course code	Course Title	Course outcome
Upon successful completion of the course a student will be able to		
MSHC-101	Statistical Methods and Experimental Designs	CO1. Define the basic concept of statistics, t-test, f-test, hypothesis, sampling etc. CO2. Understand the role of statistics in research experiments. CO3. Choose and prepare experimental designs. CO4. Analyze the results of statistical calculations and their validation CO5: Understand theoretical as well as practical knowledge of different formulas. CO6: Analysis of data pertaining to attributes and to interpret the results.
MSHC-102	Advances in Orchard Management	CO1. Memories agro-techniques for establishment and management of an orchard CO2.Summarize excess & deficiency of minerals, INM and IPM practices in orchard CO3.Layout, planting, floor management practices and study of drip and sprinkler irrigation. CO4.Analyze the factors for unfruitfulness, practices for promoting fruit production and its management. CO5: Appreciate the research advancements made in orchard management. CO6: Understand to recommend suitable package of practices for enhanced production of fruit crops.

MSHC-103	Advances in Olericulture	<p>CO1. Identify root, Cole, legume, bulb and cucurbitaceous vegetables.</p> <p>CO2. Summarize origin, distribution, area, production, classification and description of cultivars of vegetables.</p> <p>CO3. Relate sowing times, seed rate, nutritional and irrigation requirement in vegetables.</p> <p>CO4. Correlate physiological disorders, plant protection measures and seed production of vegetables.</p> <p>CO5: Develop skills for growing vegetable crops.</p> <p>CO6: Apply knowledge of intercultural practices for improving yield of vegetable crops.</p>
MSHC-104	Plant Propagation and Nursery Management	<p>CO1. Memorize principles and practices of propagation and nursery management.</p> <p>CO2. Classify and summarize propagation methods.</p> <p>CO3. Analyze factors influencing seed germination, dormancy, hormonal regulation of germination and seedling growth of horticultural crops.</p> <p>CO4. Categorize micro propagation tools, nursery types, structure and management.</p> <p>CO5: Knowledge on physiology, principles, factors influencing, media and methods of propagation of Horticultural crops</p> <p>CO6: -Gain skill in all propagation methods and technology for commercial scale adoption.</p>
MSHC-105	Systematic Horticulture	<p>CO1. Memorize about introduction, scope and importance of systematic horticulture.</p> <p>CO2. Classification and description of horticultural crops.</p> <p>CO3. Familiarization with botanical description of families, genera and species of important horticultural plants.</p> <p>CO4. Categorize fruit species and cultivars on the basis of distinguishing features.</p> <p>CO5: Understand cytological levels of various vegetable crops.</p> <p>CO6: Aware with morphological features of horticultural crops.</p>
MSHC-201	Advances in Floriculture and Landscaping	<p>CO1. Recall principles and practices of landscaping and ornamental gardening.</p> <p>CO2. Summarize principles, planning and designing of landscaping.</p> <p>CO3. Prepare Bio-aesthetic planning, bonsai culture, flower forcing.</p> <p>CO4. Explain advanced production technology of cut flowers</p> <p>CO5: Capable of managing an open field floriculture unit from planting to harvest.</p> <p>CO6: Knowledge on advanced production technologies in growing flower crops.</p>
MSHC-202	Advances in Breeding of Vegetable Crops	<p>CO1. Memorize principles and objectives of vegetable crops breeding.</p> <p>CO2. Understand recent research trends and advances in vegetable breeding.</p> <p>CO3. Determine conventional and modern breeding methods</p> <p>CO4. Description of various vegetable varieties grown in India.</p> <p>CO5: Apply advance techniques of breeding in vegetable crops.</p> <p>CO6: Discuss breeding techniques and achievements in vegetable crops.</p>
MSHC-203	Biotechnology of Horticultural Crops	<p>CO1. Define the principles and theoretical aspects of biotechnology of horticultural crops.</p> <p>CO2. Compare and estimate physical, chemical factors and growth regulators on tissue culture.</p> <p>CO3. Prepare organ culture, somatic hybrids and cybrid, cryopreservation, rapid clonal propagation in horticultural crops.</p> <p>CO4. Explain achievements of biotechnology in horticulture field.</p> <p>CO5: Able to demonstrate different techniques in biotechnology.</p> <p>CO6: Able to prepare a proposal for establishment of a tissue culture laboratory.</p>

MSHC-204	GAP for Horticultural Crops	CO1. Define organic horticulture production system CO2. Understand IPM, INM, IWM, crop production and protection. CO3. Impart knowledge of on farm processing, storage, energy and waste management, CO4. Analyze Good Agricultural Practices and their certification. CO5: Analyze Good Agricultural Practices and their certification for vegetable & MAP crop. CO6: Analyze Good Agricultural Practices and their certification for postharvest technology.
MSHC-205	Advances in Post-Harvest Technology and Management of Fruits and Vegetables	CO1. Memorize principles of postharvest management of horticultural crops. CO2. Understand Physiology and biochemical change during ripening. CO3. Prepare jam, jelly, marmalade, unfermented beverages, pickles, and chutneys, sauces, ketchup, soup, Vinegar and frozen products. CO4. Categorize guidelines for establishing processing unit. CO5: Understand technologies of post-harvest technology and its role in providing better quality produce to the consumer CO6: Demonstrate different methods of processing of fruits and vegetables.
MSHC-301	Protected Cultivation of Horticultural Crops	CO1. Define the principle of protected cultivation of horticultural crops. CO2. Understand and summarize protected structures, Growing media, soilless cultivation, hydroponics and aeroponics. CO3. Implement protected cultivation of horticultural crops and exotic vegetables. CO4. Analyze postharvest management of flowers and vegetables. CO5: Demonstrate protected cultivation of vegetable crops. CO6: Apply protected cultivation of flowers.
MSHC-302	Advances in Growth and Development of Horticultural Crops	CO1. Define growth and development of horticultural crops. CO2. Estimate and compare applications of growth promoters, inhibitors, morphactins, antitranspirants. CO3. Examine physiology of seed germination, dormancy, pollination, fertilization and fruit set, ripening and seed development CO4. Distinguish pruning and training in horticultural crops. CO5: Illustrate the mechanism of plant dormancy and plant physiology in horticultural crops. CO6: Apply plant growth regulators in horticultural crops for increasing quality production.
MSHC-303	Advances in Pomology	CO1. Outline and memorize cultural and management practices for growing tropical and subtropical fruits CO2. Categorize temperate fruits, nuts and minor fruits. CO3. Execute propagation, training and pruning of fruits. CO4. Apply the knowledge of minor and temperate fruits. CO5: Appreciate the research advancements made in the fruit crops. CO6: Able to recommend suitable package of practices for enhanced production
MSHC-401	Organic Horticulture	CO1. Explain definition, merits and demerits of Organic horticulture CO2. Summarise and relate organic horticulture with bio fertilizers and bio-dynamics. CO3. Use and articulate EM technology, HACCP exercise, certification of organic products. CO4. Analyse the global scenario of organic movement, post-harvest management of organic produce. CO5: Able to recommend suitable organic package of practices for enhanced production of horticultural crops. CO6: Able to establish various organic input production units.

MSHS-304	Master's Seminar	CO1. Acquaint with scientific terms, concepts and content preparation, etc. CO2. Outline and summarize presentation. CO3. Present and implement photographs and sketches in power point to give valuable information. CO4. Correlate research proposal or synopsis, report, manuscripts/article and publications CO5. Debate on the concern topic. CO6. Prepare research paper, articles and newsletters.
MSHT-402	Master's Thesis	CO1. Remember scientific terms of research designing, citation and bibliography. CO2. Summarize ethical dimensions of research work and knowledge to obtain appropriate approval. CO3. Correlate scientific measurements, statistical calculations and analysis of data. CO4. Explain research works, collection, classification, presentation and analysis of data. CO5. Evaluate the treatments in experiments. CO6. Prepare and Manage experimental fields.
MSHE-305	Advances in Breeding of Ornamental Crops	CO1. Identify ornamental crops. CO2. Outline and summarize inheritance of flower colour, doubleness, flower size, fragrance, post harvest life. CO3. Skilled in conventional and advanced breeding methods. CO4. Apply the knowledge for the development of ornamental crops. CO5: Capable of working on breeding programmes in flower crops. CO6: Evaluate hybrid seed production in commercial flower crops.
MSHE-306	Biodiversity and conservation of fruit crops	CO1. Memorize the basic concept of biodiversity. CO2. Strategies in germplasm conservation of fruit crops. CO3. Relate local biodiversity and geographical indication. CO4. Relate regulatory horticulture. CO5: Demonstrate different techniques in ex -situ conservation. CO6: Apply strategies in germplasm conservation of fruit crops.
MSHE-307	Biotic and Abiotic Stress Management in Horticultural Crops	CO1. Describe abiotic stresses in horticultural crops. CO2. Classify and categorize Stress and impact of stress in horticultural crop production. CO3. Study of stress indices, physiological and biochemical factors associated with stress in horticultural crops. CO4. Correlate Crop modeling in stress management. CO5: Analyze specific plant stress factors. CO6: Evaluating stress on growth and development of plants.
MSHE-308	Canopy Management in Fruit Crops	CO1: Describe canopy management in fruit crops. CO2: Classify and categorize canopy types and light utilization. CO3: Study of canopy management through plant growth inhibitors, training and pruning. CO4: Correlate development and management in fruit crops. CO5: Analyze flowering and fruiting behaviours in fruit crops. CO6: Evaluate different canopy management practices.

M. Sc. (Ag.) Seed Science and Technology

Programme Specific Outcome (PSO)

PSO1.	Learn the meaning of seed, its structure, development and maturation and their importance in crop production
PSO2.	Acquire knowledge and basic principles and mechanism involved in quality seed production of varieties and hybrids; seed quality testing and seed standards in agricultural and horticultural crops
PSO3.	Disseminate the knowledge on seed laws related to quality control and processing operations and principle involved in successful seed storage.
PSO4.	Encourage the students to become an entrepreneurship in seed production & seed business.

Course Outcomes M. Sc. (Ag.) Seed Science and Technology

Course code	Course title	Course outcome
Upon successful completion of the course a student will be able to		
MAST-501	Floral Biology, Seed Development and Maturation	CO1. Memories importance of seed and its structure CO2.Summarise seed development and maturation of various crop plants CO3. Examine pollination behavior and food reserves CO4.Explain accumulation pattern of crop plant CO 5. To understand and explain accumulation pattern of food reserves in seeds CO6. Able to understand and evaluate the application of apomixes, polyembryony
MAST-502	Experimental	CO1. Define the basic concept of statistics, t-test, f-test, hypothesis, sampling etc.

	Statistics	<p>CO2. Understand the role of statistics in research experiments.</p> <p>CO3. Choose and prepare experimental designs.</p> <p>CO4. Analyze the results of statistical calculations and their validation</p> <p>CO5. Able to collect and analyze the experimental data</p> <p>CO6. Able to make statistical calculations and their validation</p>
MAST-503	Seed Production in Field Crops	<p>CO1. Define principles of seed production and the importance of seed quality</p> <p>CO2. Outline and summarize floral biology and pollination behavior of crops.</p> <p>CO3. Implement techniques involved in quality seed production of crop plants</p> <p>CO4. Explain field and seeds standards of various crops.</p> <p>CO5. Able to understand and analyse the quality of seeds</p> <p>CO6. Able to conduct the field inspection</p>
MAST-504	Physiology of Seeds	<p>CO1. Define physiological processes involved in seed</p> <p>CO2. Relate physiological mechanism involved in dormancy and germination</p> <p>CO3. Judge different climatic factors in seed aging and physiological changes</p> <p>CO4. Explain and estimate seed vigour and their measurement</p> <p>CO 5. Able to understand the mechanism of assimilation of storage food reserve</p> <p>CO 6. Able to apply the methods of breaking dormancy</p>
MAST-505	Hybrid Seed Production	<p>CO1. Define meaning and importance of hybrid seeds.</p> <p>CO2. Outline and summarize pollination mechanism of crop plants and their relevance to hybrid seeds production</p> <p>CO3. Explain hybrid seeds production techniques in different agricultural crops</p> <p>CO4. Estimate lines involved in hybrid seeds production</p> <p>CO5. Develop and use the breeding lines involved in hybrid seeds production</p> <p>CO6. Able to determine the cost of hybrid seeds production</p>
MAST-506	Seed Processing and Storage	<p>CO1. Memorize importance and sequence of seed processing of crops</p> <p>CO2. Express basic principles and mode of action of various seed processing equipment</p> <p>CO3. Prepare seed storage methods and seed treatment procedures</p> <p>CO4. Explain factors responsible for seed deterioration during storage</p> <p>CO 5. Explain factors responsible for seed deterioration during storage</p> <p>CO 6. Able to use techniques to minimize the storage loss</p>
MAST-601	Seed Quality and Testing	<p>CO1. Grasp the significance of seed quality testing</p> <p>CO2. Compare various seed testing standards</p> <p>CO3. Choose techniques and procedure of seed sampling</p> <p>CO4. Explain seed testing procedure with tolerance</p> <p>CO 5. Able to compare and utilize the various seed testing standards</p> <p>CO 6. To understand and get the skills of seeds testing for various parameters</p>

MAST-602	Seed Legislation and Certification	CO1. Define basic concept of Seed Legislation and Certification CO2. Comment on legal procedures related to seed quality control CO3. Determine various seeds legislations of India and their significance CO4. Link with national and international organizations related to seed and their importance CO 5. Able to utilize and apply the field inspection techniques with standards CO 6. Link with national and international organizations related to seed and their importance
MAST-603	Master's Seminar	CO1. Acquaint with scientific terms, concepts and content preparation, etc. CO2. Outline and summarize presentation. CO3. Present and implement photographs and sketches in power point to give valuable information. CO4. Correlate research proposal or synopsis, report, manuscripts/article and publications. CO5. Debate on the concern topic CO6: Prepare research paper, articles and newsletters
MAST-604	Master's Thesis Research	CO1. Remember scientific terms of research designing, citation and bibliography. CO2. Summarize ethical dimensions of research work and knowledge to obtain appropriate approval. CO3. Correlate scientific measurements, statistical calculations and analysis of data. CO4. Explain research works, collection, classification, presentation and analysis of data. CO5. Evaluate the treatments in experiments. CO6. Prepare and Manage experimental fields
MAST-508	Seed Production: Principles and Practices	CO1.memorise the basic principles of seed production in varieties and hybrids of crops CO2. Relate concept of seed quality and their significance CO3. importance of field standards and seed standards in quality seed production CO4. About seed quality control system in India CO5 Able to apply seed standard in field. CO6 able to apply field stand in seed production fields
MAST-509	Seed Production Technology of Vegetable Crops	CO1. Define principles of vegetable seed production CO2. Categorize seed industry of India CO3. Choose and implement seed production techniques of vegetable crops CO4. Correlate plant quarantine and quality control CO 5. Able to apply seed testing and certification techniques CO 6. Got the ability to analyze the results as per seeds standards
MAST-510	Seed Health Technology	CO1.Memorise principles and practices of seed health. CO2.Summarise recent advances in the establishment and subsequent cause of disease development in seed CO3. Examine losses caused by seed borne diseases in true and vegetative propagated seeds. CO4. Correlate Healthy seed production, seed health testing, methods for detecting micro-organism. CO 5. Understand and analyze the results of seed health testing CO 6. Got the skill identify and inspect the seeds field for seed borne diseases
MAST-511	Seed Production in Pasture Forage and Green Manure	CO1. Identify forage, pastures and green manure crops CO2. Estimate and relate pollination behavior of forage, pastures and green manure crop CO3. Examine purity of seeds

	Crops	CO4. Illustrate seeds production techniques of forage, pastures and green manure crops CO 5. Understand and use of seed processing equipments and machines CO 6. Got the skill to test the seeds quality of pasture forage and green manure crops
MAST-512	Seed Entomology	CO1. Identify various kinds of seed insects CO2. Understand classification and behaviors of insects CO3. Examine and judge pollinators and their significance CO4. estimate in methods and techniques of insects pest control CO 5. Estimate in methods and techniques of insects pest control CO 6. Apply the techniques to minimize the storage loss due to insects
MAST-513	Seed Marketing and Management	CO1. Outline and highlight basic principles of seed marketing CO2. compare of seed supply system of India and worldwide CO3. Choose different seeds policies and organization involved in seeds marketing CO4. Structucturing business and requirements to establish business CO 5. Able to apply procedure as per seed legislation CO 6. Analyze the impact of business plan
MAST-514	Emerging Trends in Seed Quality Enhancement	CO1. Memorize basic concept of seed quality CO2. Express physical, physiological and biochemical treatments techniques to enhance the seeds germination CO3. Determine the factors which affect the seed germination and enhancement CO4. Explain the techniques like synthetic seeds, seed coating and pelleting CO 5. Able to apply artificial storage techniques CO 6. Able to develop coated and pelleted seeds
MAST-515	Testing for Genuineness and Purity of Cultivars	CO1. Memorize determine seed quality and genetic purity of the cultivars. CO2. Choose and execute methods used to increase seeds production CO3. Examine Seed quality and documentation of genetic resources CO4. Explain the DUS testing of seeds CO 5. Able to test and categories the purity of cultivar by computer based machine vision CO 6. Analyze, interpretation and documentation of results of cultivar purity
MAST-516	In-situ and Ex-situ Conservation of Germplasm	CO1. Define and highlight basic concept of In-situ and Ex-situ conservation of germplasm CO2. Relate multiplication of germplasm CO3. Examine application of cryopreservation in agriculture, horticulture and forestry crops CO4. Categorize In vitro storage, maintenance of in vitro culture under fruit crop species, spices, tubers. CO 5. Categorize in vitro conservation techniques of germplasm CO 6. Analyze the in vitro conservation data and their utilization
MAST-517	Plant Quarantine	CO1. Define the concept and importance of plant quarantine Co2. Relate the economic significance of plant quarantine. CO3. Choose New policy on seed development in India CO4. Correlate Export & import plant quarantine. CO 5. Correlate Export & import plant quarantine.

		CO 6. Choose and apply the plant quarantine techniques
MAST-518	Planting Material and Seed Production in Flower Crops	CO1. Memorize scope and importance of planting material in flower crops. CO2. Relate Global and Indian scenario in planting material and flower seed production. CO3. Integrating steps involved in hybrid seed production. CO4. Demonstration of propagation techniques; Nursery management techniques. CO 5. Understand and analyze the legal work propagation CO 6. Able to produce hybrid seeds in flower crops
MAST-519	Seed Production And Cultivation of Medicinal and Aromatic Plants	CO1. Identify and know the importance of various medicinal plant and their seeds CO2. Determine Ancient Indian knowledge of medicinal plants and their importance CO3. Discuss cultivation practices of medicinal plants and their processing. CO4. Skills to maintain the genetic purity and physical purity of medicinal plants. CO 5. Got the skills to process the seeds of medicinal crops CO 6. Able conduct field inspection and report preparation

M.Sc. (Ag.) Entomology

Programme Specific Outcomes (PSO) :

On completion of Degree Programme the students will be able to

PSO-1	Interpreting the morphological identification, bio-ecology & nature of damage of insect pests as well as the basic principles, methods and strategies of their management in various crops of Economic importance.
PSO-2	Executing management of different beneficial insects.
PSO-3	Disseminate modern agriculture knowledge as basic objective of education
PSO-4	Develop skills in practical work experiments, equipment and laboratory use along with data collection and their interpretation

Course outcome M.Sc. (Ag.) Entomology

Course Code	Course Title	Course outcome
Upon successful completion of the course a student will be able to		
MSEC-101	Statistical Methods & Experimental Designs	CO1. Define the basic concept of statistics, t-test, f-test, hypothesis, sampling etc. CO2. Understand the role of statistics in research experiments. CO3. Choose and prepare experimental designs. CO4. Analyze the results of statistical calculations and their validation CO-5: Compare different statistical methods used in agricultural research CO-6: Design new experimental designs
MSEC-102	Insect Morphology	CO1. Define & associate with insect's external morphology CO2. Outline & summarize the internal anatomy of various organs of insects CO3. Infer with different types of metamorphosis found in insects CO4. Analyze structures of different systems CO-5: Justify application of insect's external morphology in agriculture CO-6: Synthesize some techniques to study anatomical details of insects
MSEC-103	Insect Ecology	CO1. Understand the concepts of insect's ecology CO2. Highlight & associate with the principles of distribution and abundance of insects in Agro-ecosystem

		CO3.Examine & correlate with sampling methodology for insects CO4.Correlate with the effect of different biotic and abiotic factors on life cycle of insects CO-5: Compare different theories, concepts, principles & methods of insect ecology CO-6: Improve methods adopted in insect ecological studies
MSEC-104	Principles of Integrated Pest Management	CO1.Exemplify the Concept of IPM CO2.Categorize insect pests into different Categories CO3.Tabulate & associate with the concept of computation of ETL CO4.Integrate & deduce different methods of IPM CO-5: Select the correct method for pest management CO-6: Propose new tools & techniques in IPM.
MSEC-201	Insect Taxonomy	CO1.Memorize classification of Super class Hexapoda CO2. Associate with different insect orders & families of economic importance CO3.Judge & mind map the insects using taxonomic keys CO4. Correlate distinguishing characters, general biology, habits and habitats of Insect orders and economically important families contained in them CO-5: Prioritize basic features of different insect orders of economic importance CO-6: Construct new keys & methods for insect identification.
MSEC-202	Insect Physiology and Nutrition	CO1.Retrieve the basic concept of internal anatomy of different systems of insects CO2.Infer with the physiology of different systems CO3.Present the role of different nutrients for growth and development of insects CO4.Articulate artificial diet for insects rearing CO-5: Assess the validity of different concepts & facts related to insect physiology. CO-6: Modify methods & techniques used in insect physiological studies
MSEC-203	Toxicology of Insecticides	CO1.Identify & summarize the basic properties and structure, mode of action of important insecticides CO2.Outline joint action of insecticides & insecticide metabolism CO3.Assess knowledge regarding development of insecticides resistance and its management CO4.Relate with insecticide residues, their significance and environmental implications and determine diagnosis and treatment of insecticide poisoning. CO-5: Decide the correct use of insecticides CO-6: Design new & better methods & techniques for insect toxicological studies
MSEC-204	Pests of Field Crops	CO1.Find & gather information on identification, life cycles & damage done by different arthropods pests of cereals and millets CO2.Associate with identification, life cycles & nature and type of damage done by different poly-phagous pests CO3.Paraphrase identification, life cycles & nature and type of damage done by Insect pests of pulses, tobacco, oilseeds, fiber crops, forages, sugarcane CO4.Interpret integrated pest management practices in different field crops CO-5: Interpret established studies regarding to pests of field crops CO-6: Formulate new concepts in the field of pest management

MSEC-301	Biological Control of Crop Pests and Weeds	<p>CO1. Locate & gather information on important groups of natural enemies of crop pests and weeds</p> <p>CO2. Relate with role of insect pathogenic nematodes, viruses, bacteria, fungi, protozoa etc., and their mode of action.</p> <p>CO2. Infer with Mass production techniques of natural enemies of pests</p> <p>CO 3. Prepare & estimate the methods of field evaluation of various biological control agents like parasitoids, predators.</p> <p>CO4. Determine the Quality control and registration standards for biocontrol agents and sketch successful biological control projects & semi chemicals</p> <p>CO5: Evaluate efficacy of different techniques used in biological control</p> <p>CO6: Compose new methods to improve effectiveness of biological control</p>
MSEC-302	Storage Entomology	<p>CO1. Determine different factors responsible for grain losses under storage conditions</p> <p>CO2. Present the distribution, host range, biology, nature and extent of damage of various storage pests of common commodities</p> <p>CO3. Sketch the different Type of storage structures.</p> <p>CO4. Estimate & integrate the Preventive and curative measures for the management of insect pests of stored grains</p> <p>CO5: Justify with different principles & methods of storage pest management</p> <p>CO6: Design new grain storage structure & methods for safe storage of grains</p>
MSEC-303	Pests of Horticultural and Plantation Crops	<p>CO1. Estimate the nature & type of damage caused by different life stages of major Horticultural crop pests</p> <p>CO2. Paraphrase identification, the life cycle patterns, damage of different Horticultural insect pests</p> <p>CO3. Detect & categorize the weak links in life cycle of insects for easy control</p> <p>CO4. Compose & predict the different pest management techniques of horticultural pests to farmers</p> <p>CO5: Interpret bio ecological information of insect pests of horticultural crops for their management</p> <p>CO6: Improve existing methods & techniques of pest management for environmental safety</p>
MSEE-304	Plant Resistance to Insects	<p>CO1: Present History, definitions basic concepts of resistance & basis of host plant selection in phytophagous insects</p> <p>CO2: Explain Chemical ecology related to host plant resistance</p> <p>CO3: Select germplasms regarding breeding for insect resistance in crop plants</p> <p>CO4: Assume the role of biotechnology in plant resistance to insects</p> <p>CO5: Evaluate plant characters and working out their correlations with plant resistance</p> <p>CO6: Improve techniques in HPR</p>

MSEE-305	Plant Quarantine	CO1: Relate with Definition, restrictions & case histories related to quarantine CO2: Discuss Acts related to registration of pesticides and transgenic CO3: Use techniques to detect pest/pathogen infestations CO4: Examine pest risk analysis, good laboratory practices for pesticide laboratories; pesticide industry; Sanitary and Phytosanitary measures CO5: Judge Techniques & methods used in plant quarantine CO6: Improve plant quarantine rules & principles
MSEE-306	Insect vectors of Plant viruses and other Pathogens	CO1: Recall history & basic characteristics of insect vectors CO2: Explain transmission of plant viruses and fungal pathogens by sucking insect pests CO3: Experiment with transmission of mycoplasma and bacteria by leaf hoppers and plant hoppers. CO4: Analyze transmission of plant viruses by psyllids, beetles and mites. CO-5: Select correct management methods of vector management. CO-6: Invent new methods of vector borne plant disease management
MSES-401	Master's Seminar	CO1. Acquaint with scientific terms, concepts and content preparation, etc. CO2. Outline and Summarize presentation. CO3. Present and implement photographs and sketches in power point to give valuable information. CO4. Correlate research proposal or synopsis, report, manuscripts/article and publications CO5. Debate on the concern topic CO6: Prepare research paper, articles and newsletters
MSEE-402	Commercial Entomology	CO1: Write basic terms & concepts used in commercial Entomology CO2: Demonstrate management of honey bees, silk worms & lac insect in commercial aspect CO3: Organize principles and methods of pest management in residential places and public buildings CO4: Analyze economic and public health importance of insect pests in human habitation and habitats CO5: Evaluate different methods for effective management of beneficial insects CO6: Improve techniques in commercial Entomology

MSEE-403	General Acarology	CO1: Describe History, importance, habitat, collection and preservation of mites. CO2: Outline morphology, biology, classification including diagnostic characteristics of mites CO3: Utilize seasonal occurrence, biology & nature of damage of mites for their management CO4: Compare management & Culturing techniques of phytophagous, parasitic and predatory mites. CO5: Judge different methods for effective management of mite pests CO6: propose new techniques & methods in acarology
MSEE-404	Insect Pathology	CO1: Recall history, terms used & basic concepts in insect pathology CO2: Outline epizootiology, symptomatology and etiology of diseases caused by insect pathogens. CO3: Make use of different mass production techniques of pathogens CO4: Examine the role of insect pathogens in integrated pest management. CO5: Decide the use of correct insect pathogen in pest management CO6: Develop new and improved methods of studying & culturing insect pathogens
MSET-402	Master's Thesis Research	CO1. Remember scientific terms of research designing, citation and bibliography. CO2. Summarize ethical dimensions of research work and knowledge to obtain appropriate approval. CO3: correlate scientific measurements, statistical calculations and analysis of data. CO4: Explain research works, collection, classification, presentation and analysis of data. CO5: Evaluate language, figures & delivery methods for research CO6: Compose research project

M.Sc. (Ag.) Soil Science

Program specific outcomes (PSOs)

PSO1	Memorize soil genesis, soil classification, soil survey and interpretation of soil survey report in land use planning
PSO2	Develop skill on analytical techniques for soil, water and plant samples.
PSO3	Acquire knowledge on soil physics, soil chemistry, soil fertility, nutrient management and fertilizer technology for sustainable agriculture
PSO4	Provide consultancy for problems related to soil, water and nutrient management, project formulation and entrepreneurship development in Soil Science.

COURSE OUTCOME (Cos)

Course Code	Course Title	COURSE OUTCOME
Upon successful completion of the course a student will be able to		
MSSC-101	Soil Fertility and fertilizer use	CO1: Define Soil fertility and soil productivity CO2: Categorize Biological nitrogen fixation CO3: Choose Common soil test methods for fertilizer recommendations CO4: Explain Site-specific nutrient management. CO5: Assess soil test crop response correlations and response functions CO6: Plan site specific nutrient management
MSSC-102	Soil Chemistry	O1: Define different aspects of soil chemistry CO2: Summarize Soil colloids: inorganic and organic colloids CO3: Analysis of equilibrium soil solution for various parameters CO4: Experience on the knowledge of chemical behaviour of soil and their utility in research for solving field problem. CO5: Assess experimental methods to study ion exchange phenomena CO6: Design diffuse double layer theories of soil colloids
MSSC-103	Soil Biology and Biochemistry	CO1: Experience on the knowledge of soil microbes CO2: Summarize Microbiology and biochemistry of root CO3: Categorize biofertilizers and estimate soil microbial biomass CO4: Utility of soil microbes in research for solving field problem. CO5: Assess BIS standards biofertilizer for quality control CO6: Design preparation and preservation of organic manures
MSSB-104	Experimental Statistics	CO1: Define the basic concept of statistics, t-test, f-test, hypothesis, sampling etc. CO2: Understand the role of statistics in research experiments.

		<p>CO3: Choose and prepare experimental designs.</p> <p>CO4: Analyze the results of statistical calculations and their validation</p> <p>CO5: Able to collect and analyse the experimental data</p> <p>CO6: Design to make statically calculations their validation</p>
MSSE-105	Soil, Water and Air Pollution	<p>CO1: Understanding Soil, water and air pollution problems associated with agriculture.</p> <p>CO2: Analyzing different parameter for deciding level of pollution in soil and water.</p> <p>CO3: Effects of pollution on nutrients availability, plant and human health.</p> <p>CO4: Management of soil and water pollution.</p> <p>CO5: Assess to emission of greenhouse gases</p> <p>CO6: Design soil as a sink for waste disposal</p>
MSSE-106	Soil Erosion and Conservation	<p>CO1: Experience on the knowledge of soil conservation.</p> <p>CO2: Evaluation of mechanisms of soil erosion.</p> <p>CO3: Understanding concept and approach of watershed management</p> <p>CO4: Utility of soil conservation in research for solving field problem.</p> <p>CO5: Classify soil erosion</p> <p>CO6: Plan to use of remote sensing in assessment and planning of watersheds</p>
MSSC-201	Soil Physics	<p>CO1: Experience on the knowledge of soil physical properties and processes in relation to plant growth.</p> <p>CO2: Define soil physics and its scope.</p> <p>CO3: Analyzing soil-moisture characteristics curve</p> <p>CO4: Explain soil-plant-atmosphere continuum.</p> <p>CO5: Classify soil texture, structure and soil water</p> <p>CO6: Design soil- plant- atmosphere continuum</p>
MSSC-202	Soil mineralogy, genesis, classification and soil survey	<p>CO1: Identifying different rocks and minerals.</p> <p>CO2: Summarize the chemical composition and properties of clay minerals</p> <p>CO3: Express weathering sequences of minerals with special reference to Indian soils</p> <p>CO4: Correlate soil mineralogy and soil maps in relation to soil Taxonomy.</p> <p>CO5: Use land capability classification and land irritability classification</p> <p>CO6: Design land evaluation and land use type(LUT)</p>
MSSE-203	Land Degradation and Restoration	<p>CO1: Understanding processes of land degradation and their restoration.</p> <p>CO2: Knowledge about land conservation techniques.</p> <p>CO3: Understanding land use policy and approaches for reversing land degradation.</p> <p>CO4: Experience on restoration of degraded soil for optimization of crop yield.</p> <p>CO5: Use land use policy, incentives and participatory approach for reversing land degradation</p> <p>CO6: Design global issues for twenty first century</p>
MSSE-204	Land Use Planning and Watershed Management	<p>CO1: Planning for land use in proper way for higher crop productivity.</p> <p>CO2: Memorize Concept and techniques of land use planning</p> <p>CO3: Express Land capability classification.</p>

		CO4: Develop economically and ecologically sustainable agro-forestry systems for watershed CO5: Categorize types of Water harvesting in agriculture. CO6: Use water harvested water in agriculture to increase water productivity
MSSE-205	Remote Sensing and GIS Techniques for Soil and Crop Studies	CO1: Understanding basic concepts and principles of remote sensing CO2: Application of remote sensing techniques-land use soil surveys and sustainable agriculture. CO3: Analysing use of GIS for soil spatial simulation CO4: Experience on the knowledge of remote sensing and their utility in research for solving field problem. CO5: Categorize waste land and their management CO6: Create data files in a database programme
MSSC-301	Management of Problem Soil and Water	CO1: Experience on solving field problem of problem soil and waters. CO2: Outline and memorize origin and basic concept of problematic soils, and factors responsible CO3: Classify salt-affected soils and their management. CO4: Explain water quality, agronomic practices in relation to problematic soils. CO5: Use of agronomic practices in relation to problematic soils CO6: Design biological sickness of soils and its management
MSSC-302	Analytical Techniques and Instrumental methods in soil and plant Analysis	CO1: Development of confidence for setting soil testing laboratory. CO2: Experience of analytical techniques, soil, water and plant sampling techniques, their processing and handling. CO3: Preparation of solutions for standard curves, analytical reagents. CO4: Correlate analysis of soil and plant samples for macro-micro nutrients. CO5: Use of soil, water and plant sampling techniques CO6: Design identification of minerals by X-ray by different methods
MSSS-303	Master's Seminars	CO1. Acquaint with scientific terms, concepts and content preparation, etc. CO2. Outline and summarize presentation. CO3. Present and implement photographs and sketches in power point to give valuable Information. CO4. Correlate research proposal or synopsis, report, manuscripts/article and publications CO5: Ability to grasp and understand the subject CO6: Assess the depth of understand the topic

MSST-401	Master's Thesis	CO1. Remember scientific terms of research designing, citation and bibliography. CO2. Summarize ethical dimensions of research work and knowledge to obtain appropriate approval. CO3. Correlate scientific measurements, statistical calculations and analysis of data. CO4. Explain research works, collection, classification, presentation and analysis of data. CO5: Justify confidence in their ability to design and investigate the thing CO6: Design thesis in a book shape
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M.Sc. (Ag.) Plant Pathology

Programme Specific Outcomes (PSO):

On completion of Degree Programme the students will be able to

PSO- 1	Interpreting the identifying symptoms, etiology & life cycle of different pathogens as well as the basic principles, methods and strategies of their management in various crops of Economic importance.
PSO- 2	Executing management of plant diseases with an integrated approach.
PSO- 3	To disseminate modern agriculture knowledge as basic objective of education
PSO- 4	Develop skills in practical work experiments, equipment and laboratory use along with data collection and their interpretation

Course Outcomes (CO) of M.Sc. (Ag.) Plant Pathology

Code	Course Title	Course out come
MSPC-101	Statistical methods and experimental designs	CO1. Define the basic concept of statistics, t-test, f-test, hypothesis, sampling etc. CO2. Understand the role of statistics in research experiments. CO3. Choose and prepare experimental designs. CO4. Analyze the results of statistical calculations and uniformity their validation. CO5. Compare the analysis of variance and CO6. Compose of design of experiment of uniformity trial

MSPC- 102	Mycology	CO1.Define and associate basic concept and importance of mycology CO2.Outline & summarize the concept of nomenclature and classification of fungi CO3.Comparing the morphology of different genera of fungi CO4.Paraphrasing lichens and genetic variability of fungi CO5. To justify the importance of fungi in agriculture CO6. To compose the role of fungi in plant pathology
MSPC-103	Detection and diagnosis of plant diseases	CO1. Memorize the concept of Koch's postulates CO2.Outline & summarize the concept of nomenclature and classification of fungi CO3.Comparing the morphology of different genera of fungi CO4.Paraphrasing lichens and genetic variability of fungi CO5. Decide the effective control measure for the management of disease. CO6. Formulate new management practices for control of plant diseases.
MSPC-104	Principles of Plant Pathology	CO1. Memorize the concept of growth, reproduction, survival and dispersal of plant diseases CO2.Outline & summarize the host parasitic reaction and disease development CO3.Highlights the genetics of resistance and genetic engineering concept of plant diseases CO4.Paraphrasing disease management strategies CO5.Assess the genetics of resistance in plant disease development. CO6. Construct disease management practices.
MSPC-201	Diseases of vegetables and spices crops	CO1.Find and gather factors affecting disease development in crucifers, cucurbits and Solanaceous vegetables CO2.Tabulate and associate the diseases of protected cultivation CO3.Paraphrase the diseases of crucifers, cucurbits and Solanaceous vegetables CO4.Outline the symptoms, epidemiology and management of disease found in spices crops CO5 Interpret the symptoms and epidemiology of plant

		<p>diseases</p> <p>CO6. Improve the management practices to control plant diseases.</p>
MSPC 202	Ecology of soil borne plant pathogens	<p>CO1. Memorizing the effect of rhizosphere and rhizoplane on host exudates and root inhabiting fungi</p> <p>CO2.Paraphrasing the types of bio-control agent their inoculums potential and density</p> <p>CO3.Executing the mechanism of competition, predation, antibiosis, and fungi stasis.</p> <p>CO4.Illustrating the impact of suppressive soil in the management of soil borne plant pathogens</p> <p>CO5. Assess the role of bio control agents in controlling plant diseases</p> <p>CO6. Modify the application of bio control agents to increase efficiency</p>
MSPC-203	Plant Virology	<p>CO1.Locating the compositions, structure and symptomatology of viral diseases</p> <p>CO2.Associating the nomenclature classification and transmission of plant viruses</p> <p>CO3.Articulate the isolation, purification and electron microscopy of different viruses</p> <p>CO4.Correlating genetic engineering, ecology on listing of important viral diseases</p> <p>CO5. Compare origin and evolution of plant viruses</p> <p>CO6. Compose the genetic engineering, ecology, and listing of important diseases and their management</p>

MSPC-204	Plant Bacteriology	<p>CO1. Exemplify the concept of phyto-pathogenic prokaryote and their importance</p> <p>CO2. Highlight and associate the evolution and important plant diseases caused by bacteria</p> <p>CO3. Correlate the effect of nutrient requirement on the growth of bacteria</p> <p>CO4. Summarize the biology, survival and dissemination of bacteria</p> <p>CO5. Compare the biology of bacteriophages, L form bacteria, plasmids and bdellovibrio and their role.</p> <p>CO6. Compose the survival and dissemination of phytopathogenic bacteria</p>
MSPC-301	Principles of Plant Disease Management	<p>CO1. Quoting the principles of plant disease management practices by cultural, physical chemical, botanical and biological methods</p> <p>CO2. Contrasting the disease resistance and molecular approach of disease management</p> <p>CO3. Executing the effect of stickers, spreaders and their environmental hazards</p> <p>CO4. Categorizing the impact of antifungal, antibacterial, antiviral and antibiotic chemicals</p> <p>CO5. Assess the effective and ecofriendly control measure for plant diseases</p> <p>CO6. Design a new module for the management of plant diseases.</p>
MSPC-302	Diseases of field and medicinal plants	<p>CO1. Retrieving the diseases of cereals crops</p> <p>CO2. Summarizing the diseases of pulse crops</p> <p>CO3. Sketching the diseases of cash crops and oil seed crops</p> <p>CO4. Deducing the diseases of medicinal crops</p> <p>CO5. Assess the use of chemical to control plant diseases</p> <p>CO6. Compose the most suitable management practice to control plant diseases.</p>

MSPE-303	Chemicals in plant disease management	<p>CO1.Outline the classification of chemicals on the basis of chemical nature and mode of action</p> <p>CO2.Understand the use of fungicide, bactericide, botanicals and antibiotic in plant disease control</p> <p>CO3.Determine the application of different fungicide and their phyto-toxic effect</p> <p>CO4.Explain and correlate about plant protection appliances, residual effect and environmental pollution</p> <p>CO5. Assess compatibility with other agrochemicals, persistence, cost-benefit ratio, factor affecting fungicides</p> <p>CO6. Improvement on environmental pollution, residues and health hazards, fungicidal resistance in plant pathogens and its management</p>
MSPE-304	Biological control of plant diseases	<p>CO1.Highlight the concept of biological control its merits and demerits and history</p> <p>CO2.Annotate about mycoparasitism, antibiosis, hypo virulence and induced mechanism</p> <p>CO3.Comparing the compatibility of different bio control agent</p> <p>CO4.Implementing ,applying and monitoring the use of bio-control agents in IDM</p> <p>CO5. Assess the use of different biocontrol agents</p> <p>CO6. Compose the application , monitoring of bio-control in integrated diseases management</p>
MSPE-305	Seed health technology	<p>CO1. Memorize the concept of seed pathology, monocotyledons and dicotyledon seeds</p> <p>CO2. Summarize mechanism of seed transmission in relation to seed infection</p> <p>CO3. Determine the losses caused by seed borne diseases and their limit in seed certification</p> <p>CO4. Illustrate the management of seed borne disease</p> <p>CO5. Compose the application , monitoring of bio-control in integrated diseases management</p> <p>CO6. Compose the management of seed borne pathogens and procedure for healthy seed production</p>
MSPC-303	Master's Seminar	<p>CO1: Acquaint with scientific terms, concepts and content preparation, etc.</p> <p>CO2: Outline and summarize presentation.</p>

		<p>CO3: Present and implement photographs and sketches in power point to give valuable information.</p> <p>CO4: correlate research proposal or synopsis, report, manuscripts/article and publications</p> <p>CO5: Ability to grasp and understand the subject</p> <p>CO6: Assess the depth of understand the topic</p>
MSPT-304	Master's Thesis Research	<p>CO1: Remember scientific terms of research designing, citation and bibliography.</p> <p>CO2: summarize ethical dimensions of research work and knowledge to obtain appropriate approval.</p> <p>CO3: correlate scientific measurements, statistical calculations and analysis of data.</p> <p>CO4: Explain research works, collection, classification, presentation and analysis of data.</p> <p>CO5. Justify confidence in their ability to design and investigate the thing</p> <p>CO6. Design thesis in a book shape</p>