



आचार्य नरेंद्र देव कृषि एवं प्रौद्योगिक विश्वविद्यालय,

कुमारगंज, अयोध्या-224229 (उ०प्र०), भारत

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## College of Agriculture

### Course Outcomes

#### B.Sc. (Hons.) Agriculture

##### Fundamentals of Agricultural Economics

Students will be able to understand various concept, principles and its applications of economics. They will understand the banking systems like agricultural and public finance.

##### Agricultural Finance and Co-operation

Students will be able to understand different Agricultural Finance, Agricultural credit, Credit analysis, commercial banks, Agricultural Cooperation and marketing,

##### Farm Management Production and Resources Economics

Students will be able to understand farm management, Principles of farm management, production function, and relationship between input and output. They Know about insurance, resource economics, NRM and determination of most profitable level of inputs use, least cost combination, most profitable enterprise combination.

##### Intellectual Property Right

Students will be able to Understand the intellectual property Right, GATT, WTO, TRIPs and WIPO, Trademark, Industrial design, Geographical indications, Patent system in India, UPOV, PPV and FR Act of India, Plant breeder's rights,

##### Agri-Business Management

Students will be able to know about Theory Transformation of agriculture into agribusiness, New Agricultural Policy, Agri-value chain, Business environment: PEST & SWOT analysis, Management functions, programs and budget. They also know about Marketing Management, Consumer behaviour analysis, Product Life Cycle, Sales & Distribution Management.

##### Agricultural Marketing, Trade and Price

Students will be able to know about Agricultural Marketing, demand, supply and surplus of agri commodities, product life cycle (PLC), marketing channels, an integration, efficiency, costs and price spread, agricultural prices and policy trade.

##### Fundamentals of Entomology

Students will be able to understand the basic structure and functions of different parts of Insects, which is helpful in identification of insects, impact of different environmental factors on insect-pest

population, acquaint with different formulations of insecticides as well as recent methods of pest management.

### **Pests of Crops and Stored Grain and their Management**

Students will be able to identify different types of damage caused by insects, they also understand about life cycle of insect pests attacking various crops which play significant role in developing IPM module for different insect pest.

### **Management of Beneficial insects**

Students will be able to understand about economic importance of insects, become familiar with techniques of Apiculture, Sericulture and Lac culture. Students can identify important parasitoids and predators commonly being used in biological control.

### **Rural sociology and educational psychology**

Students will be able to understand sociology and rural sociology and its significance in agriculture extension, rural leadership its concept types of leaders in rural context and various methods of identifying the rural leader, role of leader in rural development. They also learn the term psychology, different branches of psychology, educational psychology and its importance in agriculture extension.

### **Human values and ethics**

Students will be able to understand values and ethics of life and agricultural education, self exploration, self-awareness, self-satisfaction and its role in agriculture extension. They also understand decision making process, motivation and sensitivity of a person.

### **Fundamentals of Agricultural extension education**

Students will be able to understand education, extension education, extension programme planning, process, objectives and principles. The students will also learn rural development in community management.

### **Communication skills and personality development**

Students will be able to understand the meaning and process of communication (Verbal and nonverbal communication), prepare lab record, field diary, bibliographical presentation etc., organize individual and group presentation, seminars, conferences as well as public speaking.

### **Entrepreneurship development and business communication**

Students will be able to understand basic concept of entrepreneur and entrepreneurship, become familiar with government schemes and incentives for promotion of entrepreneurship.

## **Agricultural journalism**

Students will be able to understand the meaning of Agricultural Journalism and agricultural journalist, form and content of newspapers and magazines its style and language of newspapers and magazines, parts of newspapers and magazines.

## **RAWE & AIA**

Students will be able to understand knowledge and skills of agricultural practices, the rural situations, status of agricultural technologies adopted by the farmers, prioritize the farmers' problems and to develop attitude of working with farm families for overall development in rural area.

## **Fundamentals of Agronomy**

Students will be able to understand about agronomy and its scope and role in agriculture, different type of seed, weed, fertilizers, tillage equipment's and differ type sowing methods. Students will also acquire the knowledge about weed and mineral nutrients of plant nutrient.

## **Agriculture Heritage**

Students will be able to know about Status of farmers in society during different periods, management of soil, disease and pest in ancient, medieval and pre-modern India.

## **Agrochemicals**

Students will be able to understand about various agrochemicals and their type and role in agriculture, effect on environment, soil, human and animal health. This course emphasizes on herbicides, fungicides, insecticides and its mode of action.

## **Practical Crop Production -I (Kharif Crops)**

Students will be able to learn various cultivation aspects knowledge of selected kharif crops through hand held training.

## **Practical Crop Production -II (Rabi Crops)**

Students will be able to learn various cultivation aspects knowledge of selected rabi crops through hand held training.

## **Principles of Organic farming**

Students will be able to know about Organic farming, principles and its scope in India, NGOs and other organizations for promotion of organic agriculture. They also learn organic ecosystem, organic nutrient resources and choice of different crops and varieties in organic farming

## **Rainfed Agriculture and watershed Management**

Students will be able to know about rainfed agriculture, watershed in India Problems and prospects of rainfed agriculture in India. They also know about water harvesting.

## **Crop Production Technology – I (Kharif Crops)**

Students will be able to develop the skills on different kharif crop production technologies, and demonstrate the seed testing of various kharif crops in the field level.

## **Environmental Studies and Disaster Management**

Students will be able to know the various resources available on the earth, concept of biodiversity and ecosystem of the world and India. They also know the social and ethical issues of the society and climate associated issues and their mitigation.

## **Crop Production Technology – II (Rabi Crops)**

Students will be able to develop the skills on different rabi crop production technologies.

## **Farming System and Sustainable Agriculture**

Students will be able to identify the suitable cropping system under local environmental conditions and evaluate the cropping systems with different criteria in all the context. Students can learn about design the different farming systems for different ecosystems.

## **Introductory Agrometeorology and Climate Change**

Students will be able to analyze the situation of weather variables for different climatic conditions and their measurements

## **Geoinformatics and Nanotechnology for Precision Farming**

Students will be able to understand advanced technologies used in precision farming, gain the skill on handling of GPS and image capturing and processing. They also understand the concept and application of nanoparticles in agriculture.

## **Weed Management**

Students will be able to know the biology of weeds, demonstrate the different weed management practices. They can articulate best recommendation of weed management to the farmers and know the mode of action of different herbicide.

## **Fundamentals of Horticulture**

Students will be able to understand different branches of horticulture, its importance and scope, demonstrate advance technologies like training, pruning, propagation methods etc. in horticultural crops. They also learn the use of synthetic plant growth regulators.

## **Production Technology for Vegetable and Spices**

Students will be able to understand different types of vegetable gardening its importance and scope. They also learn different cultivation practices of vegetable crops and Spices

## **Production Technology for Ornamental Crops, MAPs and Landscaping**

Students will be able to understand the package and practice for cut flowers under open condition and different types of medicinal and aromatic plants. They also understand recent advances in production technologies like as protected cultivation of high value flower crops

## **Production Technology for Fruit and Plantation Crops**

Students will be able to the package and practice for cultivation of major fruits and plantation crops.

## **Landscaping**

Students will be able to demonstrate the advance gardening technologies like, vertical gardening, roof gardening, terrace gardening. They familiar with the Trees, Shrubs and herbaceous perennials, Climber and creepers, Annual flowering and foliage.

## **Protected Cultivation**

Students will be able to understand the procedure and basic principle for construction of Polyhouse, low tunnels and mist house. They demonstrate the off-season production of high value vegetable and flower crops.

## **Post-harvest Management and Value Addition of Fruits and Vegetables**

Students will be able to understand the causes of post-harvest losses, importance of post-harvest processing of fruits and vegetables, know about time of harvesting of different horticultural crops and indicators of fruit ripening. They also know about value addition through Intermediate moisture food, preserve, candy Drying/ Dehydration of fruit and vegetable crops.

## **Hi-Tech Horticulture**

Students will be able to understand the protocols for production through advance technologies like micro-propagation, hi-tech nursery production, the role remote sensing in less environment dependent production of fruit and vegetable crops

## **Fundamentals of Plant Pathology**

Students will be able to investigate and identify a plant pathogen based on their specific characters, handle the basic and advance plant pathological equipment, distinguish the symptoms and actual causal agent of the plant disease

## **Principles of Integrated Pest and Disease Management**

Students will be able to observe and investigate different type of insect pest and plant diseases based on their specific characters. They can get specific information about different bio-agents used against insect pest and plant diseases.

## **Diseases of Field and Horticultural Crops and Their Management I**

Students will be able to observe and investigate a plant disease based on their specific characters in *Rabi* season, understand the etiology and epidemiology of different plant diseases in *Rabi* season.

## **Diseases of Field and Horticultural Crops and Their Management II**

Students will be able to observe and investigate a plant disease based on their specific characters in *Kharif* season, understand the etiology and epidemiology of different plant diseases in *Kharif* season.

## **Production Technology of Bio-agents and Bio-fertilizers**

Students will be able to identify different type of beneficial bio-agents, know about the methodology of mass production of different bio-agents and bio-fertilizers.

## **Mushroom Cultivation Technology**

Students will be able to learn by hand held training on mushroom production technology of different types of mushrooms like edible, medicinal and poisonous.

## **Fundamentals of Soil Science**

Students will be able to understand scope, soil formation from weathering of rocks and minerals and properties of different types of soil, classification and mapping

## **Agricultural Microbiology**

Students will be able to understand different beneficial soil microorganisms its importance and scope, practice the isolation, identification and purification of beneficial soil microorganisms, and Understand role of soil microorganisms in soil nutrients transformation and fertility management

## **Problematic Soils and their Management**

Students will be able to understand characteristics of different types of problematic soils and their management and understand irrigation water quality its management and uses.

## **Manures, Fertilizers and Soil Fertility Management**

Students will be able to know various functions organic manures and mineral nutrients in crop production.

## **Fundamentals of Plant Breeding**

Students will be able to understand the various components to structure a plant breeding programme. Students can learn the impact of IPRs including PBR, PVP and PPVFRA. Students will acquire independent ability to carry out statistical analysis of data and Interpretation of results in breeding programs.

## **Crop Improvement- (*Kharif* crops)**

Students will be able to acquire the knowledge on various techniques involved in crop improvement on different *kharif* crops.

## **Crop Improvement- (*Rabi* crops)**

Students will be able to acquire the knowledge on various techniques involved in crop improvement on different *Rabi* crops.

## **Introduction to forestry**

Students will be able to understand definitions of basic terms related to forestry, objectives of silviculture, forest classification and management of forest.

## **Soil and Water Conservation Engineering**

Students will be able to understand soil erosion, land degradation, tillage system and its importance and scope. They also do the demonstration of advanced technologies like rainwater harvesting, pond, technology of water conservation for sustainable development

## **Farm Machinery and power**

Students will be able to know about the sources of farm power in India and their use in



Agriculture, understand I.C engine, transmission system steering system brake system and different farm machines. Students also know different advanced method of sowing, planting and harvesting machines with their operation, care and maintenance.

### **Protected Cultivation and Secondary Agriculture**

Students will be able to understand the design procedure and construction of poly house and demonstrate the off-season production of vegetable crops. They can become familiar with the use of protected structure for hi-tech horticulture and important equipment's used in polyhouse.

### **Renewable Energy and Green Technology**

Students will be able to understand the various aspects of different renewable energy sources.

### **Elementary Mathematics**

Students will be able to understand and apply fundamental concepts of mathematics. Students will acquire the knowledge on theoretical concepts of Coordinate Geometry, Calculus, and Matrix theory and able to develop the computational skills on mathematical problem solving.

### **Statistical Methods**

Students will be able to understand and apply various fundamental concepts of statistics in agriculture and allied disciplines. Students will acquire the knowledge on descriptive Statistical Measures and Coefficients, Probability theory, Sampling theory, and Testing of hypothesis.

### **Agricultural Informatics**

Students will be able to acquire the basic skills on utility of computer and its operational applications in MS Office and file management.

## **M. Sc. (Ag.)**

### **Micro Economics**

Students will be able to understand fundamental concepts of Demand function, and apply micro economic principles for the welfare of farming community.

### **Research Methodology**

Students will be able to understand role and importance of research in the social science, and identify the appropriate research design for different research problems.

### Farm Management Analysis

Students will be able to understand the basic principles of farm management, identify and analyze gathered information to arrive at farm decisions, and to apply farm management theories to livestock and crop farming, and in managing land, labor and capital

### Agricultural Marketing and Prices

Students will be able to understand the basic concepts of agricultural marketing, and to identify the ways to minimize market risks.

### Optimization Techniques

Students will be able to understand the applications of optimization techniques, and to solve practical problems on linear programming.

### Macro Economics

Students will be able to understand monetary and fiscal policies, and integration of macroeconomics with monetary analysis.

### Econometrics

Students will be able to acquire knowledge of regression models, tests for autocorrelation, multicollinearity and heteroscedasticity.

### Agril. Finance and corporation

Students will be able to acquire knowledge of demand and supply function, analysis of average rate of return, and assessment of credit worthiness.

### Agril. Production Economics

Students will be able to acquire knowledge regarding optimal use of resources.

### Fundamentals of Meteorology

Students gain knowledge regarding weather elements, composition and atmosphere. Acquire skill of measurements of weather parameters.

### Agro-Meteorological Instrumentation

Students gain knowledge for principles and operation of meteorological instrumentation in Agromet.

### Basic Physics for Agrometeorology

Students gain knowledge for Fundamentals of physical units and its conversion. Acquire skills for elementary electronics for agriculture.

### Micro-Meteorology

Students will develop skills for measurement of global radiation and interception.

### Evapotranspiration

Students gain knowledge for basic laws of radiation, radiation interactions with environment.

### Applied Agrometeorology

Students learn concepts of crop protection from weather, protection from frost, forest fire, droughts and floods.

### Forest Meteorology

Students are expected to acquire skill in measurement of precipitation in the forest, climatic effects of deforestation and reforestation.

### Hydrometeorology

Students will learn application of climatic data in hydrological scheduling irrigation, drought indices and their application.

### Remote Sensing and its Application in Agriculture

Students learn remote sensing for climatic conditions. Acquire skill for meteorological forecasts and system epidemiology of pests and diseases.

### Fundamentals of Climatology

Students gain knowledge for climatological factors and their effect on crop growth and yield, global warming and climatology of India.

### Fundamentals of Agril-Meteorology

Students learn fundamentals of weather forecasts for agriculture, agricultural seasons and their significance on crop production.

### Crop Weather Modelling and Computation Technique

Students develop skills for agro climatic analysis of crop production, computer techniques to meteorological database management.

### Agro climatic Analysis

Students are expected to learn modelling techniques of crop weather relations, methods of forecasting crop yield and disease development.

### Environment and Pollution Meteorology

Students learn about types of environmental pollution and its impact on climate and crop production.

### Weather Forecasting and Weather Based Agro Advisory

Students gain knowledge for different methods of weather forecasting, use of satellite and cloud imageries in weather forecasting.

### Weather Modification

Students learn the concepts of microclimatic changes and their effects on crops, air pollution and public issues involved in weather modification.

### Aquatic Meteorology

Students learn about the optimum climate for fish production, crop, water and climatic variability for aquatic production in quantity and quality.

### Pest and Disease Climatology

Students gain knowledge regarding protection of animals from adverse weather and immunity against disease and parasite.

### Advances in Agricultural Meteorology

Students develop skill in using recent and modern equipments of meteorology in crop weather and simulation.

### Modern Concepts in Crop Production

Students become familiar with fundamental concepts of crop growth related to ideal plant type for organic farming and sustainable agriculture.

### Principles and Practices of Weed Management

Students acquaint the role and importance of research in the field of weed management and understand the appropriate management practices for weed control.

## Principles and Practices of Water Management

Students gain information about the role of water in plants and understand appropriate management practices for water in controlled environment for increasing water use efficiency.

## Soil Fertility Management and Fertilizer Use

To acquaint the role and importance of soil fertility, productivity and understand symptoms of nutrient deficiency and toxicity symptoms.

## Agronomy of Major Field Crops (Kharif)

Students learn about the role and importance of origin and varietal improvement of major kharif crops. To understand the quality improvement and industrial uses of major products of crops.

## Crop Ecology and Geography

Students acquaint the basic concepts of crop ecology to Identify adverse climatic effects on crop productivity for controlling adverse effects on crop ecology.

## Soil Conservation and Watershed Management

Students study about different type of soil erosion, field studies of different soil conservation measure runoff and soil loss measurement, laying out runoff plot.

## Fodder and Forage Crops

Students familiar with the importance of fodder forage crops and understand the biochemical changes and factors affecting of fodder crops.

## Agronomic Field Experimentation

To gain knowledge about the principles and objectives of field experimentation.

## Tillage in Crop Production

Students familiar with the soil properties affecting crop growth and understand the concept of minimum tillage, puddling and soil sickness.

## Agronomy of Major Filed Crops (Rabi)

Students acquaint the role and importance of origin and varietal improvement of major Rabi crops.

### Dry land Farming

Students acquaint the concept of dryland, rainfed farming and understand types of droughts and adaptation of plants to droughts.

### Management of Problem Soils

Students gain knowledge about the concept of nutrient imbalance in problem soils and understand the crop tolerance to saline, sodicity, acidic and water logging.

### Medicinal and Aromatic Plants

Students learn about the role and importance of medicinal and aromatic plants in human health. And acquainted knowledge about the medicinal and aromatic plants according to botanical characteristics and uses.

### Seed Production Agronomy

Students familiar with the role of seed industry in country and understand the concept of seed purity and seed health.

### Organic Farming

Students will be able to understand the role of organic farming and its relevance in India and understand different farming systems, Integrated Pest management, land and water management.

### Principle of Management and Organizational Behaviour

Students acquaint the learner with meaning and concepts of management and organizational behaviour. Understanding the concepts, processes, significance, and role of management and organizational behaviour.

### Agribusiness Environment and Policy

Students will be able to understand the role of agriculture in Indian economy, structure of agriculture, trend of production, processing and marketing as well as help in making Agricultural price and marketing policies

### Managerial Economics

Familiarize the Students with the fundamental economic concepts and principles in the context of managerial decision making.

### Managerial Accounting and Control

Students will be able to understand the concept and applications of financial, double entry system, cost accounting and management accounting.

### Communication for Management and Business

Make Students proficient in written as well oral communication. The focus will be on business related communication.

### Business Laws and Ethics

Students will be able to acquire knowledge the various business laws and also ethical practices to conduct the business properly.

### Marketing Management

Students will be able to understand the basic concepts, tools, and functions of marketing.

### Human Resource Management

Students study about the Human Resources Management, Recruitment and Selection Process and Quality of work life, employee welfare measure

### Financial Management

Students gain knowledge about the application of Financial and investment decisions.

### Production and Operations Management

Students gain knowledge about the basic concepts, tools, and functions of production management.

### Research Methodology in Business Management

Students identify the appropriate research design for different research problem

### Project Management and Entrepreneurship Development

To train the Students to develop new projects and encouraging them to start their own ventures

### Computers for Managers

To acquaint the Students with the knowledge and use of computers and simple applications of computers in managerial decisions.

### Management Information Systems

Students will develop an understanding and utility of MIS. The focus will be on imparting knowledge of the basic concepts, development, functions and usage of MIS

## Operations Research

Students gain knowledge how to minimize the cost and maximize the profit. Techniques help in solving business problems by making decision in risk and uncertainty.

## Rural Marketing

Students will be able to understand the issues in rural markets like marketing environment, consumer behaviour, distribution channels, marketing strategies, etc.

## Agricultural Marketing Management

Students will be able to understand the concept about various policies, strategies and decisions relating to marketing that can be developed by agribusiness firms.

## Food Technology and Processing Management

To acquaint the Students with different food processing techniques and their management.

## Fertilizer Technology and Management

To acquaint the Students in latest advances in fertilizer technology management

## Management of Agro Chemical Industry

To familiarize the Students with the agrochemicals, their structure, classification and development and also how to manage the agro-chemical industries.

## Farm Business Management

To acquaint the students with the basic principles of farm management dealing with the analysis of farm resources having alternatives within the framework of resource restrictions.

## Seed Production Technology and Management

To apprise students regarding principles and efficient management of seed production technology.

## Technology Management for Livestock Products

To impart knowledge about management of livestock products, product development, quality control, preservation and marketing strategies for livestock products.

## Fruit Production and Post-Harvest Management

To impart knowledge into the students regarding agro-techniques of fruit crops and their post harvest management.



### Farm Power & Machinery Management

To acquaint the Students with the farm mechanization status in the country and various techniques for farm machinery management and marketing

### International Trade & Sustainability Governance

To impart knowledge to the Students of international trade in agriculture and various provision under WTO in the new trade regime.

### Management of Agribusiness Cooperatives

To provide the students an understanding about the agribusiness cooperative organizations and their management.

### Agribusiness Financial Management

To impart trainings to the students regarding various aspects of financial management for agribusiness.

### Food Retail Management

To assist students in understanding the structure and working of food marketing system in India, to examine how the system affects farmers, consumers and middlemen and to illustrate the response of this dynamic marketing system to technological, socio-cultural, political and economic forces over time

### Management of Agricultural Input Marketing

Students will be able to understand the different marketing concept and marketing system in context of agricultural inputs.

### Feed Business Management

To acquaint the students with the role and importance of feed industry and the production of feed for livestock and poultry

### Agri Supply Chain Management

The course introduces Students to the concepts and processes of agricultural supply chain management, framework for structuring supply chain drivers; network designs, demand forecasting, inventory planning, sourcing decisions and IT enablement of supply chain.

### Management of Veterinary Hospitals

The objective of this course is to acquaint the Students about the designing, planning, organizing, and controlling the veterinary hospitals for optimizing the use of space, capital, skill and other resources.

### Poultry and Hatchery Management

Students will be able acquire knowledge about the importance of management in poultry industry, managing a poultry and hatchery enterprise, planning production of poultry products, financial, personnel and marketing management.

### Management of Floriculture and Landscaping

To expose the Students with floriculture technology and its Agri-business implications including international trade

### Fundamental of Extension Education

Students will be able understand the concepts and application of rural development programmes.

### Process and method of Communication

Students gain information about the role and importance of communication process and familiar with the method of Communication.

### Agricultural Journalism

Students are expected to understand the role and technique of collection of material of Rural development for journalism.

### Fundamental of Rural Sociology

To acquaint Students about the specialized topics and advances in field of genomics and genomics assisted molecular breeding

### Communication media and information technology

Students are expected to learn about use of media in agricultural development and prospect of new communication and information technology

### Psychological of Human Behaviour

This course aims to build capacities of Students to understand the fundamental psychological processes which guide human behaviour at individual, group and community levels in specific contexts, to develop sound extension strategies.

### Diffusion and Adoption of Innovation

This course aims to equip Students to conduct outcome-oriented social and behavioural science research and to develop novel and effective field focused extension strategies followed by adoption of such novel models with adequate replicability, while advancing knowledge on processes governing success of those strategies.

### Entrepreneurship Development

This course is aimed to develop a critical understanding among extension Students about how the technology commercialisation process is linked to entrepreneurship development.

### Management in Extension

Students are made aware about the nature extension organization and the role of qualities, coordination of management in extension.

### Process of Photography

Students are familiar with the concept of photography in which expected to learn about the role of camera and film.

### Rural Community and Work Experience

Students are familiar with the social and economic component of village.

### Managerial skill for extension professional

Students understand the nature, importance of extension professional and familiar with the concept the learning skill.

### Visual and Graphics communication

Students are understand the role and importance of communication. And familiar with the method for designing the visual and graphics communication.

### Methods of Social Research

Students gain knowledge about the concept of science, design of social research and conduct of research including data collection analysis, interpretation and report writing.

### Programme planning in Extension

Students are familiar with organizational structure for planning at various level of extension programme.

### Training for human resource development

Students understand the concept of Human resource development and basic assumption of training.

### Training Methodology

Students are gain knowledge about the principle of learning and understand the training method of training programme.

### Basic Biochemistry

Students are expected to learn about Acid, base buffer and their role in biological reaction

### Techniques in Biochemistry

Students can learn about the different techniques involved in detection and quantification of various biomolecules in in vitro experiments as well in natural systems

### Soil Biochemistry

Students are introduced with soil biochemistry.

### Seed Biochemistry

Consultancy/training at block/district headquarters of Agriculture/Agri clinics for creating awareness & remedies about seed germination, seed viability and reasons of seed spoilage with precautions.

### Biochemistry of intermediary metabolism

Students are gain knowledge about the biochemistry of higher plant and bacterial photosynthesis; biosynthesis of fat; biochemistry and function of hormone and vitamin in intermediary metabolism

### Plant Biochemistry

Students can explore knowledge about hormones, alkaloids, toxic substances to the NGO's, block headquarters, farmers training centres, processing industries, food diet centres.

### Biochemistry of food grain, fruits and vegetable

Students gain information about the importance of fruit and vegetable in human diet.

### Human Nutrition

Students are estimation of nutritive value of food protein, essential amino acid.

### Animal Biochemistry

Students are gain knowledge about glucose, calcium, iron and total serum cholesterol in the blood of cow, buffalo and goat, Determination of urea, uric acid in the animal and

human preparation of blood slide and determination of cholesterol human blood and bird egg.

### Research Methodology

Students are familiar with seminar paper presentation and how to write thesis?

### Insect Morphology

Students will be able to understand the concept about insect integument, head, thorax, wings, legs and abdomen

### Insect Ecology

Students get the concept and construction of life table, computer simulation, modelling, estimates of population density, sampling methods and plans, estimation of dispersal and migration

### Integrated Pest Management

To familiarize the Students with principles of insect pest management, including concept and philosophy of IPM.

### International Agricultural Research and research ethics

Students get familiar with the history of agriculture research and ethics.

### Insect Pest of Field Crop

Students will be able to study about life cycle of two insect pest one each from hemi and holo meta bolo us group.

### Insect Pests of Fruits, Vegetables, Spices and Medicinal Plants

To impart knowledge on major pests of horticultural and plantation crops regarding the extent and nature of loss, seasonal history, their integrated management.

### Storage Pests and their Management

To impart knowledge about Storage pests – insects, mites, rodents and their development, their economic importance; and strategies for their management

### Toxicology of insecticides

Students are expected to gain information about the principles of toxicology

### [Insect Resistance in Crop Plants](#)

To orient the Students with structure and mode of action of important insecticides belonging to different groups, development of resistance to insecticides by insects, environmental pollution caused by toxic insecticides and their toxicological aspects.

### [Insect Systematics](#)

Students will be able to learn about the relationship of systematics and taxonomy.

### [Insect Anatomy, Physiology and Nutrition](#)

To impart knowledge in students about the anatomy and physiology of insect body systems; nutritional physiology; and their applications in entomology

### [Forest Entomology](#)

Students are familiar with insect damage in forest trees and their product.

### [Insect Vectors of plant viruses and other pathogen](#)

Students will be able to understand the important insect vector of plant pathogen.

### [Biological control](#)

Students are expected to learn about the history and importance of biological control.

### [Applied acarology](#)

Students are expected to acquire knowledge about the mite population and to learn the Method of testing pesticide against mites.

### [Soil arthropods and their management](#)

Students are study about various harmful and beneficial soil invertebrates and microorganism.

### [Principle of Seed Technology](#)

Students introduced about the seed technology

### [Seed Legislation & Certification](#)

Students gain information on seed legislation in relation to seed certification and quality control systems

## Floral Biology, Seed Development and Maturation

Students study about the floral types, structure and biology in relation pollination mechanisms sporogenesis microsporogenesis and megasporogenesis; gametogenesis - development of male and female gametes and their structures; effect of environmental factors on floral biology.

## Seed Production in Field Crops

Students gain information about Basic principles in seed production and importance of quality seed. Floral structure, breeding and pollination mechanism in self - pollinated cereals and millets

## Seed Physiology

Students study about the Physiology of seed development and maturation; chemical composition, synthesis and accumulation of seed reserves , induction of desiccation tolerance hormonal regulation of seed development .

## Seed Pathology

Students familiar with the history and economic importance of seed pathology in seed industry and plant quarantine

## Seed Legislation and Certification

Students gain knowledge about the Historical development of Seed Industry in India.

## Seed Processing and Storage

To impart knowledge on principles, techniques and methods of seed processing, treatment and storage including methods for Seed extraction, Seed processing sequence for different crops; Seed drying methods, etc.

## Seed Quality Testing

To impart knowledge on principles, techniques and methods of seed testing and seed quality enhancement including Seed Germination test, Genetic purity assessment; application of tolerance in seed testing; advanced non-destructive techniques of seed quality analysis etc.

## Seed Entomology

To impart knowledge on Collection, identification and familiarization with the stored grains/ seed insect pests and nature of damage caused by them

## Seed Marketing and Management

To empower the Students to become seed entrepreneurs by imparting knowledge on seed industry management and marketing strategies.

### Principles of Genetics

Students gain knowledge about the basic perspective on genetics.

### Principles of Cyto-Genetics

Students are getting information about the chromosome structure; prokaryotes and eukaryotes; function and replication.

### Principles of Plant Breeding

Students are introduced with principles of plant breeding.

### Method of Plant Breeding

Students gain knowledge about method of breeding self-pollinated, cross pollinated and asexually propagated crop, pure line and mass selection.

### Principles of Quantitative Genetics

Students gain theoretical knowledge and computation skills regarding components of variation and variances, scales, mating designs and gene effects.

### Improvement of field crop

Students getting information about breeding work of important crop.

### Seed production, testing & certification

Students will be able to understand the importance of seed technology; general technique of seed production in important, agricultural and vegetable crop.

### Breeding for stress resistance

To acquainted the Students about the nomenclature and classification of stress.

### Genetics Engineering and Biotechnology

Students getting information about vitro technique, nuclear, plasmid and bacteriophage.

### Breeding for crop Quality

Students are expected to getting information about quality traits in field crop needs and prospect for genetic improvement.



## Molecular Genetics

Students would be taught basics of genome structure and organization, generation of molecular markers-basic principles, molecular marker techniques, data handling and analysis of GM crops.

## Heterosis Breeding

Prediction of Hybrid performance, BLUP, Genetic diversity and heterosis.

## Theory and advance plant breeding

Students getting information about component of variation and their estimation in single gene.

## Mutagenesis

Students are expected to learn about the history of experimental mutagenesis.

## Population Genetics

Students are getting information about foundation of theoretical population genetics.

## Plant Genetics Resource

Students are expected to learn about the basics of genetic resource.

## Soil mineralogy, genesis and classification

Students learn about the Structural chemistry, taxonomy of soil of India, soil morphology. And also know about the crystal system and crystal structure of soil minerals, minerals identification.

## Soil Chemistry

Students are expected to know concepts of chemicals in soils, soil colloids, solubility relationship of important nutrients, nutrients dynamics, chemical and electrochemical properties of submerged soil, chemistry of acid and salt affected soils.

## Soil biology and Biochemistry

Students gain knowledge about the soil biota, soil microbial ecology, soil microbial biomass, bio fertilizer, soil enzymes, microbial transformation, production of biogas and manures.

## Soil Physics

Students will be able to acquire knowledge about the soil water behaviour, water management practices, soil physical environment, soil structure, puddling and its effects, soil air characterization in relation to plant growth.

## Soil fertility and plant nutrition

Students develop the skills in balanced use of nutrients, nutrients uptake mechanism, nutrients release and carry over effects

## Soil Technology

Students are expected to learn about technology scope, extent, distribution and chemistry of problem soils. Also know about the quality of irrigation water and management of saline water for irrigation.

## Soil survey and land use planning

Students study about the soil survey procedures, remote sensing techniques, criteria for classification at different of soil resource information for agricultural and non agricultural uses.

## Soil water plant relationships

Students gain the knowledge about soil plant atmosphere continuum pathways of water movement. Models for water use, plant growth and yield in term of water availability.

## Manures and fertilizers

Students develop the skills in role of manures in sustainable agriculture, rural urban enriched composts preparation, and sustainable agriculture.

## Soil pollution

Students are expected to know pollution problems and hazards, nature and sources of pollutants, meta-toxicity, effect on nutrient availability and plant growth.

## Instrumental techniques in soil and plant analysis

Students learn about the principles of visible ultraviolet and infrared spectrophotometry, tracer techniques in soil and plant research.

## Land degradation and restoration

Students study about the basic concepts, types, factors and processes of soil degradation, policy consideration.

### System approach in soil research

Students develop the skills in system concepts its characteristics and significance in soil research, use of model for decision support system.

### Molecular genetics

Students gain the knowledge in model genetic system, principles of inheritance, qualitative and quantitative traits, DNA structure, DNA as genetic material, gene transfer in prokaryotes, eukaryotic genome.

### Celi biology

Students study about the cell theory, origin and its concepts, membrane lipids: types and its function, structure and function of ribosomes, role of auxin and gibberellins in regulation of cellular function.

### Plant tissue culture

Students learn about the plant tissue culture, laboratory organization and equipment, sterilization techniques, mutagenesis and selection of mutants in vitro.

### Enzymology

Students develop skill in enzyme general introduction and historical resume, specificity of enzyme substrate binding site, factor affecting enzyme activity, active site mapping, clinical application of enzyme.

### Protein engineering

Students know about the protein structure and functional relationship, post transitional, modification, fusion protein stability and delectability, alteration in biological properties.

### Molecular biology

Students are expected to know about the historical development of molecular biology, biosynthesis in purines, mitochondrial genome, repetitive and non-repetitive DNA, DNA sequencing method and approaches.

### Genetic engineering principle and method

Students will be able to acquire knowledge about recombinant DNA technology, DNA ligases, various method of gene isolation, animal transgenic, intellectual properties.

## Introduction of industrial biotechnology

Students learn about the concept and scope of industrial biotechnology, single cell protein and vitamins, industrial production of commercially important bio fertilizer, phytoremediation.

## Biotechnology and society

Students develop skill by know benefit of biotechnology, biotech and world economy, biotech and food safety, risk assessment, management and labelling, Indian initiative on human genome mapping.

## Principles of immunology

Students know about the history and scope of immunology, immunoglobulins, chemistry and structure and their biological functions, immune regulation, immunological application in plant science.

## Plant pathological techniques

Students learn about the laboratory equipments, their use, cleaning and sterilization of glassware, molecular techniques, chromatography and spectrophotometry, use of EM an SEM.

## Mycology- 1

Students are expected to know introduction and importance of fungi milestones in mycology general characteristics, kingdom – Stramenopila: general characteristics of Phylum- Oomycota.

## Introductory Bacteriology

Students learn about the nutritional growth factors, Classification and identification: group of bacteria including metabolism, Prokaryotic inhibitors, bacteriocins, fermentation, respiration, biological oxidation and variability. Important bacterial diseases: blight of rice, blight of cotton, wilt of solanaceous crops, soft rot of vegetables.

## Diseases of Field Crops

Students study about the white rust of crucifers, Smut of wheat, barley, sorghum, maize, bajra and sugarcane, Bunt of wheat and rice, Wilts of chickpea, Grassy stunt of sugarcane and phyllody of Til. Ear cockle of wheat and Khaira disease of rice.

## Seed Pathology

Students learn about the seed infection routes, location of inoculum, outcome of infection. Immunodiagnostic methods, nucleic acid based methods including PCR.

## Biological Control of Plant Diseases and Weeds

Students gain knowledge about the principles of biological control and factors affecting biological control.

## Principles of plant pathology

Students will be able to develop skills by Concept, nature and classification of diseases with examples. Phenomenon of plant infection losses.

## Diseases of plantation spices and medicinal plant

Students are expected to know importance, losses, disease symptoms, disease cycle, epidemiology, and integrated management of following diseases, disease of different crops and forest trees.

## Introductory virology

Students gain knowledge about history of plant virology and economic importance of plant virus, symptomatology, taxonomy of plant viruses, crop fruits, disease management, general control measure.

## Chemicals in plant disease control

Students study about the definition of pesticide and related terms. History and development of chemical advantage, residue and health hazard, fungicidal resistance of plant pathogens.

## Diseases of fruits and ornamental crops

Students develop the skills in symptomatology and life cycles of pathogen, epidemiology and management of fruits and ornamental crops.

## Diseases of vegetable crops

Students will be able gain knowledge about the vegetable diseases, diseases of solanaceous crops, causal organism, favourable condition and management of causal organism.

## Plant disease management

Students learn about the history, principle and concepts of plant disease control, alteration of soil PH, chemical systemic and non-systemic fungicides, integrated disease management.

## Plant disease clinic

Students study about the role and importance of plant disease clinic, survey, collection of disease samples from farmer's fields, disease diagnosis and management.

### Mycology- 2

Students will be able to gain knowledge about the phylum- Chytridiomycota, general characteristics of phylum, life cycle of genus.

### Essential Statistical Methods

Students will be able to understand and apply fundamental concepts of statistics in agriculture and allied disciplines.

### Probability Theory

Students will be able to understand the basic concepts in probability theory, and application of probability theory in decision-making problems of economics, business, and other diversified fields.

### Statistical Methods

Students will acquire theoretical knowledge and practical applications of descriptive statistical measures and coefficients, probability theory, sampling theory, and testing of hypothesis.

### Computer Application

Students will acquire knowledge about the utility of MS-Office, Multimedia and File management, and gain skill full knowledge about word processing, power point presentations, and data entry in excel.

### Mathematical Methods

Students will be able to understand and apply fundamental concepts of mathematics in problem solving.

### Design of Experiments-I

Students will be able to understand the basic principles of Design of Experiments. Students will acquire knowledge about the layout and analysis of various experimental designs to analyze the experimental data.

### Sampling Techniques-I

This course aims at exploring the various methods for data collection, analysis and interpretation of data. The Students are familiarized with the various probability and nonprobability sampling designs.

### Statistical Genetics-I

Students will be able to gain theoretical knowledge and computation skills regarding genetic components of variation, detection and estimation of linkage.

### Basic Mathematics for Economics

This course aims at enhancing the computational skills of Students by developing in them the mathematical problem solving approach in topics related to calculus, and matrix theory.

### Applied Multivariate Analysis

The course provides exposure to multivariate data analysis involving multivariate normal distribution, multiple and partial correlation and regression.

### Basic Design & Analysis of Experiments

The Students would be exposed to concepts of Design of Experiments so as to enable them to understand the concepts involved in planning, designing their experiments and analysis of experimental data.

### Designs and Analysis of Surveys

This course is meant for training the Students in measures of demographic parameters, estimation procedures of demographic parameters. Students would also be exposed to population projection techniques.

### Economic Statistics

This course is meant for training the Students in econometric methods and their applications in agriculture. This course would enable the Students in understanding the economic phenomena through statistical tools and economics principles.

### Statistical Inference

This course is meant to familiarize the Students with inferential statistics related to methods of estimation and testing of hypothesis.

### Applied Multivariate Methods

The course provides exposure to multivariate data analysis involving multivariate normal distribution, estimation and testing of parameters.

### Principles of Plant Physiology-I Cell Organelles, Water relation and mineral nutrition

To familiarize the students about the methods to determine cell and soil water potential; Concept of osmosis and diffusion.

## Principles of Plant Physiology-II Metabolic Processes and growth regulation

To introduce the students with the knowledge on cellular structure and function that determine of carbon and nitrogen metabolism, lipids, enzymes and secondary metabolites in plants.

## Crop Physiology

To introduce the students with the knowledge on Role of crop physiology in different branches of agriculture, crop growth and productivity, crop physiological processes influencing crop growth and productivity

## Physiological, Molecular and Ecological aspects of photosynthesis and productivity

To acquaint the students with the practical skills in plant sampling for leaf area and biomass estimation; analysis of growth and yield parameters – LAD, NAR, CGR, LAI, LAR, SLA partitioning efficiency.

## Mineral Nutrition: Physiological and Molecular aspects

To introduce the students with the knowledge about Nutrient Elements and their Importance; Nutrient Acquisition; Concept of Foliar Nutrition; Beneficial elements; factors influencing the nutrients availability; critical levels of nutrients.

## Herbicide Physiology

To appraise the students with the methodologies pertaining to Bioassay for different herbicides, influence of pH, adjuvants, contact angle, surface tension on penetration, absorption and translocation of herbicides, quantification of herbicides potency relative potency, quantification of herbicides, herbicides interaction (synergistic, antagonistic and additive), role of adjuvants on penetration, translocation, contact angle, surface tension etc.

## Post-Harvest Physiology

To familiarize the students with knowledge about Senescence and ageing in plants, ethylene, the senescence hormone, leaf senescence, chloroplast degradations, monocarpic plant senescence.

## Abiotic Stress Responses in Plants

To familiarize the students with knowledge about determination of soil water potential and content by psychrometry and other systems. Stress imposition and quantification of stress, stomatal conductance

## Plant Growth Regulators and Plant Development



To appraise the students with the Principles of bioassays, physic-chemical techniques and immunoassay, Extraction of hormones from plant tissue

### Seed Physiology

To acquaint the students with the knowledge about Structure of seeds and their storage resources, seed developmental patterns and source of assimilates for seed development; pathway of movement of assimilates in developing grains of monocots and dicots,

### Morphogenesis, Tissue culture and Plant Transformation

To introduce the students with the knowledge on Morphogenesis, the cellular basis of growth and morphogenesis, anatomical and ultra-structural aspects of growth.

### Experimental Techniques in Plant Physiology

To acquaint the students with the practical knowledge about Determination of energy utilization of crop plants, growth structure analysis, radiation measurements and interception, hydro phonics and culture, WUE, determination of water use efficiency by gravimetric approach,

## Ph.D.

### Advanced Micro Economics

Students will be able to gain knowledge of core concepts and models in the field of microeconomics, and to apply micro economic models to analyze real-world microeconomic phenomena and to evaluate issues of microeconomic policy. .

### Advanced Production Economics

Students will be able to understand the concepts of resource allocation, and to analyze agricultural production functions and their characteristics.

### Advanced Agricultural Marketing

Students will be able to understand the concepts of market organization, and to gain knowledge of the marketing efficiency and agricultural prices.

### Advanced Econometrics

This course is meant to acquaint the Students with optimization of resources with the help of Econometric models.

### Advanced Farm Management Analysis

This course aims at developing the skills in Students for managing the farm with the help of principles of farm management.

## General Meteorology

Students learn different laws of radiation and green house effect. Climate change and its causes.

## Agricultural Meteorology

Students gain knowledge for climate change and agriculture. Development and calibration of crop weather relationships and models.

## Weather Modification

Students learn about vegetation and environment for weather modification. Air pollution and public issues involved in weather modification.

## Advance Techniques in Agril. Meteorology

Students develop skills in handling and measuring techniques of soil moisture balance and measurement techniques of weather elements.

## General Micrometeorology

Students learn micrometeorology, laws of radiation. Develop skills of measuring techniques in micrometeorology.

## Potential Evapotranspiration

Students are expected to learn the concepts of potential, reference and actual evapotranspiration.

## Operational Agro meteorology

Students gain knowledge about climate change and its impact on agriculture. Application of climate water budgeting technique.

## Remote Sensing Applications

Students learn remote sensing satellite and product application of remote sensing in agriculture.

## Applied Agro Climatology

Students gain knowledge in using statistical concepts applied to climatological data and different models of soil moisture.

## Environmental Management

Students learn about basic issues in environmental sciences, remote sensing in weather forecasting.

### Crop Weather Modeling

Students develop skills in model validation and sensitivity analysis, linkage of crop model for different applications.

### Weather Forecasting Techniques and Application

Students will learn about risk analysis in adoption of weather based agro-advisory and feedback of agro advisory, accuracy analysis of weather forecast.

### Mineral Nutrition of Field Crops

Students gain knowledge about historical background and scope of mineral nutrition. And understand deficiencies and role of elements in plant metabolism.

### Advances in Agronomy

Students acquaint the concepts of recent trends in problems on production of agronomy.

### Farming System

Students understand the methodology of farming approaches and acquainted farming system research for different agro climatic zones of India.

### Soil Fertility Management

Students gain knowledge about the concepts of soil fertility and productivity in relation to soil fertility, bio-fertilizers and their significance in crop production.

### Advances in Dry land Farming

Students understand the nature and extent of dry land farming. Identify special problems of dry land agriculture. Assess crop planning and management practices.

### Crop Adaptation and Distribution

Students gain knowledge about the scope, climatic and soil factors determining the crop distribution.

### Management of Saline and Alkali Soils

Students acquainted the nature of saline soil, sodic soil, alkali soils and understand harmful effects of salts and responses to soil reaction.

### Herbicides Chemistry and Physiology

Students gain knowledge about the history and classification of herbicides toxicity in plants.

### Environment in relation to Crop Productivity

Students understand the eco environment of plant, natural, artificial environments and factors affecting crop productivity. To acquainted the knowledge of agronomic practices for improving crop productivity.

### Advances in Extension Education

Students will be able to know about the modern techniques of extension education

### Advances in Training Technology

The aim of this course is to introduce the new perspectives related to “innovation” and help learners to apply the AIS framework especially in dealing with scaling up knowledge.

### Advanced Research Designs and Techniques in Extension Education

Students are familiar with research design and understand the concept of scaling techniques.

### Advanced Instructional Technology

Students are understand the role and importance of agriculture education in India.

### Gender Issues in Rural Development

To familiarise the Students with the gender issues.

### Transfer of Technology in Agriculture

Students are familiar with the concept of technology in agriculture and the methods of transferring the technology in agriculture.

### Entrepreneurship Development

Developing the skills under entrepreneurial development

### Organizational Development

Students are gain knowledge about organizational structure of development departments.

### Media Management

Students gain information about Mass communication and the principal of media management.

## Enzymology

Students gain information about the nature and function of enzyme, factor affecting enzyme action, enzyme system and coupled reaction.

## Inorganic Nitrogen Metabolism

Students acquire knowledge about the nitrogen cycle in the nature, biological nitrogen fixation, carbon assimilation in chemotrophs, oxidation of ammonia to nitrate and phosphorylation involved in denitrification.

## Biochemistry of Nucleic acid

Estimation of DNA & RNA leaves, stems and other part of the crop.

## Molecular Biochemistry

Students gain information about the replication of micro molecule, Biosynthesis of enzyme under control DNA, Biochemistry of the gene action, Induction and repression. Biochemical of heredity and mutation.

## Biochemistry of Pesticide

Helps Students to learn about the structure and mode of action of plant protection agents such as insecticides, fungicides, herbicides, and similar compounds.

## Biochemistry of Crop Quality

To familiarise the Students with the bio chemistry associated with crop quality.

## Advanced Biochemistry and immunology

Students gain information about enzyme and classification of enzyme, biosynthesis of coenzyme biochemistry of AMP, immunology and membrane.

## Advance in Insect pest management

Students gain detailed information about the physiology of insect.

## Advances in Insect Physiology

Detailed physiology of nervous and endocrine systems of Insects.

## Advanced Insect Ecology

To impart advanced practical knowledge of causal factors governing the distribution and abundance of insects and the evolution of ecological characteristics. Study insect-plant interactions; get acquainted with biodiversity and conservation.

### Advance Insect Systematics

Students acquaint with the concept of supra specific and intra specific categories.

### Advance in biological control

Students acquire knowledge about the mass culturing of biological control agents. Effect of semio- chemical on natural enemies.

### Advances in Toxicology of Insecticides

To acquaint the students with the latest advancements in the field of insecticide toxicology, biochemical and physiological target sites of insecticides, and pesticide resistance mechanisms in insects.

### Quarantine entomology

Students are familiar with insect pest quarantine- domestic and international.

### Molecular Approaches in Entomological research

To acquaint the students with the isolation of DNA/RNA, Purity determination, base pair estimation, restriction mapping of DNA, demonstration of PCR, RFLP technique.

### Hybrid Seed Production

Students understand the methods of hybrid seed production in major agricultural and horticultural crops

### Planning, Seed Movement and Quality Control

Students gain information about the seed production programme for small, medium and big entrepreneurs demand forecasting preparation discussion with seed village programming producers, growers on farm plan working out models on seed quality.

### Seed Vigour and Crop Productivity

Students will be able to understand the theory terminology and concept - genetic and physiological importance of seedling vigour to seed technology.

### Testing for Genuineness and Purity of Cultivars

Students familiar with the objective of cultivar purity test, general principles and methods involved.

## DUS Testing for Plant Variety Protection

Imparts training on differentiating the normal and abnormal morphology of any organ and thus is important to be a good clinician

## Advances in Seed Science Research

The students acquainted with knowledge about Physiological and molecular aspects of seed development and control of germination and dormancy: gene expression during development tolerance and conservation, etc.

## Advances in Post Harvest Management of Seed

Trains Students on laboratory assessment of organ functioning

## Seed Senescence

Concepts indices for measuring seed deterioration physiological and bio-chemical manifestations of seed deterioration, changes in respiration, enzymes.

## Advances in Seed Science Research

Students are expected to learn physiological and molecular aspects of seed development and control of germination and dormancy.

## Advances in Post-Harvest Management of Seed

Students gain information about economic seed processing and storage plant

## Advanced Biotic resistance breeding

Screening of germplasm against various biotic factor, demonstration of breeding techniques management of insecticide and fungicide.

## Advanced quality breeding

Students getting information about the quality concept and quality consciousness of the crop

## Advanced heterosis breeding

Students understand the concept of heterosis and inbreeding depression, approaches and method in exploitation of heterosis.

## Advance Genetics

Students are used to develop trend in genetical research, development genetics, differentiation and development, genetics cause of aggressiveness and abnormal behavior.

### Special Breeding Technique

Students use to learn the modification of conventional breeding technique improvement of pedigree and SSD method.

### Advance Crop breeding

Students getting information about current problem, scope and future strategy of breeding cereals, pulses, oilseed, forage and fiber crop.

### Quantitative Genetics

Students gain knowledge about quantitative systems/ techniques related to genetic improvement of crops, G x E Interaction etc.

### Advance Abiotic Resistance Breeding

Screening of germplasm against various abiotic factors related to resistance, demonstration of breeding techniques of resistance breeding, management of herbicides, survey of field crops

### Advance Production Breeding

Students are expected to gain information about biological, genetic and physiological ceiling in productivity improvement, physiological approaches to productivity, plant type concept, growth analysis parameters, sustained growth vigour.

### Advance Seed Technology

To impart knowledge on the recent developments in various frontier areas of seed science and their application in seed technology.

### Advanced soil physics

Students gain the knowledge about Stock's law synthetic soil conditioners, law of plastic flow, cohesive and adhesive forces in soil, air flow equation and air capacity of the soil.

### Chemistry of submerged soil

Students are expected to know changes taking place on submerged of soil, reduction products, decomposition of organic matter under submerged conditions and availability of nutrients.

### Soil geology, pedology and micro pedology

Students learn about the geology in soil studies, relation between geology and soil mineralogy, petrology and petrography, mineral analysis in soil genesis and classification.



### Techniques of soil research and instrumentation

Students study about the techniques of pots and sand culture and field experimentation. Atomic absorption Spectro photometry, RF value, polarography and its application in soil.

### Advances in soil fertility

Students develop the skills in historical development, concept of soil fertility, plant response to nutrients and function. Soil fertility evaluation, fertilizer reaction in soil.

### Physical chemistry of soil

Students gain the knowledge about nature of organic and inorganic soil colloids, amphoteric nature and dynamic concept of soil colloids, ion activity concepts, ion diffusion, ion fixation, transport of ion.

### Radioisotopes in soil research

Students learn about the radioactive isotopes and their application in agriculture, principles of radiotracer methodology.

### Gene cloning theory

Students are expected to know about the concept of gene cloning, restriction in enzymes, modifying enzyme list, in vitro packaging, EMBL family and vector, binary vector for foreign DNA, new trends and future prospects.

### Transformation technology

Students learn about the introduction of plant transformation, direct gene transfer method, quality improvement, recombinant antibody and downstream processing, trans gene position, trans gene features, future prospect of plant transformation.

### Molecular biology and plant genetics stress

Students study about the abiotic stress, molecular mechanism of drought submergence, plant defence mechanism in response to abiotic stress.

### Genes of agronomic importance and its application

Students develop the knowledge by know about the present and potential application of genetic engineering crop production, chitinase, 1-3 beta glucanase, RIP fungal Protein, thionin, PR proteins, polymers and foreign protein in seed.

### Advances in molecular market technology

Students learn about the market morphological, biochemical and molecular markers, double haploids PCR techniques, gene pyramidal, association mapping SNP.

### Advances in plant genetic engineering

Students are expected to know about the promoter/tissue specific promoter, gene silencing, gene therapy, gene interaction, genome editing, terminator technology.

### Advanced virology

Students are expected to know virus taxonomy, structure and physicochemical characterization of viruses, structure and functions of virus domains, phylogenetic relationship, origin, evaluation and interrelation with animal viruses.

### Advanced bacteriology

Students learn about the bacterial classification, bacterial taxonomy, host pathogen interaction, primary disease determinants toxin and enzymes, type of bacterial polysaccharides.

### Advanced mycology

Students gain knowledge about international code of botanical nomenclature, morphology of conidia and conidiogenous, classification of phylum Zygomycota, use of PCA and RELP for identification of fungi.

### Bacterial virus and virus like diseases of plants

Students study about the different types of bacterial diseases and virus diseases commonly found in different types of crops, their management, treatment and control.

### Insect's vectors of plant viruses and other pathogen

Students learn about the important insect vectors and their characteristics, transmission of plant viruses and other pathogens.

### Advanced techniques in plant protection

Students are expected to know about the pest control equipment, principles operation, maintenance, selection, application of pesticides and biological agents, seed dressing, soaking, root deep treatment.

### International agricultural research and research ethics

Students study about the history of agriculture in brief, global agricultural research system, need, scope opportunities, research integrity, computer ethics, standards and problems in research ethics.

### Plant quarantine and pest risk analysis

Students develop the skill by know about the WTO regulations, symptomatic diagnosis of disease, external and internal, contamination of food with toxigenic microorganism and their eliminations.

### Molecular and biotechnological plant pathology

Students learn about the biotechnology definition, history, scope and importance of bio technology, use of tissue culture technique in plant pathology, PCR, RAPD, RFLP, AHLF to study the pathogenic biodiversity.

### Epiphytology fore costing and assessment of losses

Students are expected to know epiphytology, phytoepidemics of the past and present, importance and selected literature, forecasting analysis, factor affecting virus disease epidemics.

### Host plant resistance

Students study about the definition of resistance, immunity, and tolerance, history and importance of host plant, type of resistance, matching technique change in virulence pattern, host gene centers.

### Linear Models and Regression Analysis

This course aims at providing the basics of linear estimation theory, along with the testing of hypothesis in linear models.

### Advance Statistical inference

This is an advanced course in Statistical Inference that aims at describing some advanced level topics related to research such as robust estimation and Bayesian inference.

### Advance Design of Experiments-I

This is an advanced course in design of experiments that aims at describing some advanced level topics to the Students who wish to pursue research in experimental designs.

### Advance Design of Experiments-II

This is an advanced course in design of experiments that aims at describing some advanced level topics to the Students who wish to pursue research in experimental designs.

### Advance Sample Surveys-I

This is an advanced course in sampling theory that aims at describing some advanced level topics to the Students who wish to pursue research in Sampling Theory.

### Advance Sample Surveys-II

This is an advanced course in sampling theory that aims at describing some advanced level topics to the Students who wish to pursue research in Sampling Theory.

### Plant Nutrition and Metabolism

It provides knowledge on basic physiological processes governing nutrient uptake, physiological role of elements, factors influencing uptake, internal remobilization of nutrient element during starvation and adaptation strategies.

### Advances in Production Physiology

The course provides a comprehensive theoretical and hands on experience and expertise to students on various aspects of Crop production

### Physiological and Biochemistry of growth regulators

The course provides knowledge about Experiments on quantitative analysis of hormones, interaction of growth regulators and morphogenetic response of growth substances

### Advances in Photosynthesis and Respiration

To acquaint the students with the practical knowledge about measurement of photosynthetic gas exchange. Infra-red gas analysis. Field monitoring of photosynthesis and respiration

### Advances in Stress Physiology

To acquaint the students with the practical knowledge about Experiments related to drought, excess moisture, salinity, alkalinity, ionizing radiations and pollutions

### Bioenergetics of Plant Processes

The course provides knowledge about Gibbs free energy and chemical potential, law of thermodynamics, energy fluxes, conversion of chemical and electrical energy.

## **College of Veterinary and Animal Husbandry**

### **B. V. Sc. & AH**

#### **Veterinary Anatomy unit I & II**

Students develop the skills in dissection, knowledge of variation in structure due to species, age and sex, learn the embryology and histology of body systems.

#### **Veterinary Physiology & Biochemistry unit I & II**

Students are trained on basic physiological functions of body systems, laboratory assessment of organ functioning

#### **Veterinary Pharmacology Unit I & II**

Students are expected to understand the concepts of drug designing, drug delivery and mechanism of actions, their Pharmacokinetics and pharmacodynamics

#### **Veterinary Parasitology Unit I & II**

Students study morphology and life cycle of parasites, their relationship with host and environment, trains students on parasitic diseases, laboratory assessment of different body fluids for parasites including staining techniques.

#### **Veterinary Microbiology, Unit I & II**

Students learn identification of microorganisms-their morphology, structure and nature, techniques in diagnosis of different infectious diseases, discusses prevention strategies disease control.

#### **Veterinary Pathology, unit I & II**

Students are expected to gain knowledge of Pathological changes, gross and histologic lesions., understand the pathogenesis of diseases, disease development and clinical pathology and Post mortem examination

#### **Veterinary Public Health & Epidemiology unit I & II**

Students learn concepts of milk and meat hygiene, epidemiology of diseases, environmental pollutions, causes, effects and related acts

## **Animal Nutrition unit I & II**

Students gain knowledge on feed formulation, designing and analysis, nutritional deficiency diseases and their prevention and nutrient requirement, mode of intake of food and its utilisation in the body.

## **Animal Genetics & Breeding**

Students learn Basics of breed improvement, improving the abilities of animals for certain traits entire populations can be enhance. the process of inheritance during generations.

## **Livestock Production Management unit I & II**

Students are expected to learn various systems of livestock production, Integrated Farming systems, profitable dairying, care and management of pregnant, lactating animals and work bullocks.

## **Veterinary Gynaecology & Obstetrics unit I & II**

Students gain scientific knowledge on physiological reproductive processes of female genital system, clinical aspects of estrous cycle, pregnancy, parturition and puerperium in small and large animals, knowledge on pathologies affecting the female genital system and practical training in assisted reproduction techniques such as artificial insemination and embryo transfer.

## **Veterinary Surgery & Radiology unit I & II**

Students learn basics of suturing, anaesthesia and hands on training on surgical techniques.

## **Veterinary Medicine unit I & II**

Students learn disease diagnosis, treatment and prevention strategies of different diseases

## **Veterinary & Animal Husbandry Extension Education unit I & II**

Students gain knowledge on various techniques/methods for transfer of animal husbandry technologies through suitable audio-visual aids, collection of data, preparation of different literature like leaflet, Posters, charts, Flash cards and use of audio visual aids, Information system, networking and use of various ICT tools.

## **M.V.Sc.**

### **General Animal Nutrition**

Students are expected to learn nutritional requirements of different animals and feed/ ration formulation for different animals.

### **Mineral & Vitamin Nutrition feed additives**

Students learn about requirement, functions, deficiency and toxic effects of vitamins, essential, probably essential and toxic minerals. Understanding soil-plant-animal-human relationship for utilization of minerals. Recent trends in the use of feed additives, probiotics, prebiotic and enzymes in animal feeding

### **Protein and Energy Nutrition and their Evaluation**

Techniques of feed preservation, processing and health impacts

### **Animal Nutrition-Energy and Protein**

Students become familiar with fundamental concepts of energy and proteins, metabolism of carbohydrate, fat and protein and their efficiency of utilization requirement of carbohydrates, fat and proteins for various physiological functions.

### **Feed Technology**

Students are introduced to the subject, formula feed manufacturing and different operations involved. Layout, designing, operation and management of feed mill.

### **Feed Conservation, Storage and Quality Control**

Students are expected to learn about inherent nutritional quality of feed ingredients and feeds, evaluation of feeds and fodders and feed preservation techniques, procurement and storage of feed ingredients.

### **Ruminant Nutrition**

Students gain knowledge on Requirement of nutrients for different physiological functions in various ruminant species, test concepts of feeding the nutrients for maximizing production.

### **Non-Ruminant Nutrition**

Students learn about the requirement of nutrients and feeding of various non-ruminants species for efficient quality production

### **Nutrition of Companion, Laboratory, Wild and Zoo Animals**

Students learn about preparation, storage and evaluation of feeds and feeding standards of companion/ laboratory /wild and zoo animals

### **Research Techniques in Animal Nutrition**

Planning and designing of experiments, use of various techniques in estimating chemical and bio-chemical constituents in feeds, fodders, blood, milk, rumen liquor, meat, wool etc are taught.

### **Non-Conventional Feedstuffs and Toxic Constituents / Antimetabolites In Animal Feedstuff**

Students are expected to understand the importance of alternate feeds and their use in augmenting profit in livestock farm. Different toxins present in feed stuffs, their properties and detoxification techniques

### **Animal Cytogenetics and Immunogenetics**

The course educates about basic principles of cytogenetics and immunogenetics and their applications in improving farm animals.

### **Molecular Genetics in Animal Breeding**

Students are given concepts about molecular techniques to identify molecular markers as an aid to selection.

### **Population and Quantitative Genetics In Animal Breeding**

Students study genetic structure of animal population and importance of genetic variation and covariation among traits.

### **Selection Methods and Breeding Systems**

The course explains the methodology of selection and breeding systems for genetic improvement of livestock and poultry.

### **Biometrical Techniques in Animal Breeding**

Students are made aware about the various biometrical techniques for data analysis and their applications in animal breeding research.

### **Conservation of Animal Genetic Resources**

Students are expected to learn about the concept of conservation of Animal Genetic Resources and their sustainable utilization.

### **Cattle and Buffalo Breeding**

Students are educated about the concept of cattle and buffalo breeding

### **Poultry Breeding**

Students are taught the concepts of the advances in poultry breeding practices.



### **Laboratory Animal Breeding**

The course educates about the laboratory animal breeding principles.

### **Cattle And Buffalo Production and Management**

Students learn basic aspects of dairying in India compared with developed countries, problems and prospectus of dairying, detailed aspects of care and management of different classes of dairy cattle and buffaloes.

### **Sheep And Goat Production and Management**

Students learn the status of sheep and goat farming in India, importance of record keeping, principles of housing and feeding, breeding management to improve the reproductive efficiency and detailed account on care and management of different classes of sheep and goat.

### **Swine Production and Management**

The course impart knowledge on various aspects of swine farming in India, principles of housing, breeding, feeding and health care of pigs, management practices at different stages of growth and economic pig production systems.

### **Laboratory Animal Production and Management**

The course educates the students become familiarize with various aspects of rabbit farming, problems and prospectus, principles of housing, breeding, feeding and health care of rabbits, rats, mice and guinea pigs, measures to reduce the mortality in young ones at different seasons .

### **Lpm 605 Shelter Management**

The course familiarizes students with type of houses suited for different livestock under varying climatic conditions.

### **Principles Of Environmental Hygiene and Waste Management**

The course familiarizes students on principles of air and water hygiene with reference to impurities and inclusions of water, collection and disposal of waste from the animal house, modern techniques in manure disposal and biosecurity measures to be adapted for hygienic production of livestock products.

### **Climatology and Animal Production**

The course familiarizes students on climate, weather, various climatic factors and their role in production and health of animals in both temperate and tropics, micro and macroclimatic conditions of animal house and assessing the heat tolerance of bovines.

## **Poultry Farm and Hatchery Management**

The students are expected to learn the basic aspects of housing, feeding, breeding and health care of poultry and comparing the performance under cage and floor system of management of poultry, biosecurity measures to be followed to reduce mortality and efficient hatchery management to produce healthy young ones.

## **Farm Animal Behaviour**

To make acquainted students on principles of farm animal behaviour with regard to environmental influence, group formation, social behaviour and behavioural adaptations under domestication.

## **Integrated Livestock Farming System**

The course familiarizes on various aspects viz., scope and limitations of integrated livestock farming system, recent approach and economic feasibility of different integration models for sustainable production.

## **Equine Production and Management**

The course educates the students become familiarize with principles of housing, breeding, feeding and health care of different classes of horse, stable routines and measures to reduce the mortality in young ones at different seasons.

## **Wild Life Management and Conservation**

Students learn with the principles and concepts of wild life sanctuaries and national parks, classification of wild animals, role of authorities in conservation and management of wild animals in captivity.

## **Livestock Business Management**

Students gain knowledge in principles, planning, technical approach and preparing financial statement in Livestock Business Management and preparing projects for financing.

## **Bacteriology**

Students gain knowledge on general microbiology and important aerobic bacteria. Determinants of pathogenicity and its molecular basis

## **Bacteriology - II**

Students gain knowledge about spore forming bacteria and some important aerobes and anaerobes.

### **Veterinary Mycology**

Students gain knowledge general and pathogenic mycology.

### **Systematic Animal Virology**

Students study viral properties, epidemiology, pathogenesis, diagnosis and control of diseases caused by animal viruses.

### **Principles of Immunology**

Students gain knowledge about fundamental principles of immunology and its applications in the field of infectious diseases.

### **Vaccinology**

Students are made to understand science and practice of vaccines for prevention of bacterial and viral diseases.

### **Diagnostics of Infectious Diseases**

The course provide training in essential immunological and molecular diagnostic techniques.

### **Veterinary Helminthology**

To learn about various aspects of trematode and cestode parasites of veterinary importance.

### **Veterinary Helminthology - II**

Students are expected to learn about various aspects of nematodes, thorny-headed worms and leeches of veterinary importance.

### **Veterinary Entomology and Acarology**

Students are expected to learn various aspects of arthropods of veterinary importance.

### **Veterinary Protozoology**

The course projects the importance and to impart detailed knowledge on various aspects of protozoan parasites.

### **Parasitological Techniques**

The course imparts practical knowledge on various techniques used in veterinary parasitology

### **Clinical Parasitology**

The course deals with collection and examination of clinical material for parasitological investigations and study of clinical cases.

### **Trends In Control of Livestock and Poultry Parasites**

Students learn about integrated approach for the control of helminths, arthropods and protozoan parasites of veterinary importance.

### **Immuno-parasitology**

The course imparts knowledge about the immunology, immune-diagnosis and immune-prophylaxis of ecto and endoparasites of veterinary importance.

### **Parasitic Zoonoses**

The students provide the students with an in-depth knowledge of occurrence and importance of parasitic zoonoses and how these parasites are diagnosed and controlled.

### **Parasites Of Zoo and Wild Animals**

Objective To learn about biological and control aspects of parasitic diseases of zoo and wild animals.

### **Malacology**

Objective To learn about the details of various snails involved in diseases transmission

## **Ph. D. COURSES**

### **Modern Concepts of Feeding Ruminants and Forage Utilization**

Students gain knowledge of modern concepts in nutrient requirement and feeding and enhanced utilization in ruminant and recent development in analysis of forages.

### **Modern Concepts of Feeding Monogastric Animals**

Students gain knowledge on modern concepts in nutrient requirement and feeding of monogastric livestock

### **Modern Concepts of Feeding Monogastric Animals**

Students gain knowledge on modern concepts in nutrient requirement and feeding of monogastric livestock

### **Nutrition and Rumen Fermentation**

Students gain knowledge on nutrient requirements for neonatal and post-natal development of livestock, recent concepts of rumen fermentation and its manipulation

### **Advances in Micronutrients**

Students are expected to gain knowledge on nutrient requirements for neonatal and post-natal development of livestock, recent concepts of rumen fermentation and its manipulation

### **Advanced Techniques in Nutrition and Research**

Students are expected to learn about the use of advanced analytical techniques in nutrition research

### **Advances In Feed Technology**

Students learn about modern feed processing methods and automated feed plant layout

### **Clinical Nutrition**

Students study impact of nutrition on health, immunity, digestive/metabolic disorders, reproductive performance, bacterial and parasitic infestations, organic toxins and stress nutrition, feeding management of sick animals.

### **Nutrient and Drug Interaction**

Students study the effects of drugs on nutrient utilisation

### **New Feed Resources and Toxicants in Animal Feeding**

The course focus on newer feed resources and their value in animal feeding and various toxic substances prevalent in feeds and fodders

### **Recent Advances in Animal Genetics**

Students gain knowledge about the latest tools and techniques of animal genetics and their uses in animal sciences

### **Recent Trends In Animal Breeding**

Students are acquainted with recent trends in animal breeding and designing of need-based breeding strategies.

### **Advances In Biometrical Genetics**

Students gain knowledge about recent advances in population genetic theory and application in animal breeding

### **Advances In Selection Methodology**

Students learn about the latest advances in selection theory and their application in animal breeding.

### **Bioinformatics In Animal Genetics and Breeding**

Students gain knowledge on basic concepts of bioinformatics and their applications in Animal Genetics and Breeding.

### **Advances In Molecular Cytogenetics**

Students are expected to learn about the advances in cytogenetics and their application in animal genetic and breeding

### **Utilisation Of Non-Additive Genetic Variance in Farm Animals**

Students are educated about the recent advances in estimation of non-additive genetic variation and possible use in developing synthetic population of livestock and poultry.

### **Applications Of Remote Sensing and Geographic Information System in Parasitology**

Students study the emerging applications of Remote Sensing and Geographic Information System in parasitology.

### **Molecular Diagnostics and Vaccine Development in Parasitology**

Students learn about the molecular analysis of parasites for diagnosis, disease control, drug development and vaccine production.

### **Host Parasite Interactions**

Students gain knowledge on the importance of host-parasite interactions.

### **Advances In Protozoology**

The course discuss the latest scientific developments on various aspects of protozoan parasites.

### **Advances In Helminthology**

The course discuss the latest scientific developments on various aspects of trematodes and cestodes.

### **Advances in Helminthology – II**

The course discuss the latest scientific developments on various aspects of nematodes and thorny-headed worms.

### **Advances In Entomology and Acarology**

The course discuss latest scientific developments on various aspects of arthropods.

### **In Vitro Cultivation of Parasites**

The course discusses Development of skills for cultivation of various parasites in the laboratory for research and practical control.

### **Emerging and Re-Emerging Parasitic Diseases**

The course deals with the emerging and re-emerging parasitic diseases.

### **Bionomics of Parasites**

The course imparts knowledge on ultrastructure, physiology, biochemistry and bionomics of important parasites.

### **Environmental Parasitology**

The course teaches the effect of environmental changes and ecological disturbances on the emergence, proliferation and transmission of parasitic diseases.

### **Advances In Bacteriology**

Students are expected to learn the latest development in the field of bacteriology

### **Advances in Mycology**

Students gain knowledge about the latest development in the field of mycology.

### **Bacterial Genetics**

Students are expected to learn the basic aspects of bacterial genetics.

### **Microbial Toxins**

Students are expected to gain knowledge about the bacterial and fungal toxins.

### **Molecular Determinants of Bacterial Pathogenesis**

Students are expected to learn the molecular mechanisms of bacterial pathogenesis.

### **Advances in Virology**

Students study about virus structure, their nucleic acids and proteins; latest trends in animal virus research.

### **Molecular And Genetic Aspects of Viral Pathogenesis**

Students are expected to gain knowledge on molecular and genetic determinants of viral virulence and pathogenesis; animal models for studying viral pathogenesis.

### **Structure Function Relationship of DNA And RNA Viruses**

Students are expected to gain knowledge on the relationship between structure and function of DNA and RNA viruses of animals for the development of next generation viral vaccine and antivirals.

### **Slow Viral Infections and Prions**

Students are expected to gain knowledge on slow viral infections; properties and replication of prions, and diseases caused by them.

### **Molecular Immunology**

The course familiarize with advances in research on immune system molecules such as antigens, antibodies, complement, cytokines, surface molecules, etc.

### **Advances In Cellular Immunology**

Students learn on advances in research on immune cell biology and cellular interactions in immune responses.

### **Cytokines And Immunomodulators**

Students are taught about structure and function of various cytokines and other immunomodulators.

### **Advances In Vaccinology**

Students are expected to gain knowledge about advances in vaccine research and modern approaches to vaccine development.

### **Advances In Immunodiagnosics**

Students are expected to gain knowledge learn and employ modern approaches to immune-diagnosis.

### **Modern Immuno-technology**

The course provide training on production of monoclonal antibody and other immune-biologicals by various modern methods.

### **Current Topics in Infection and Immunity**

The course discusses on recent developments in the immunobiology of major viral, bacterial and fungal diseases of animals.

### **Veterinary Microbial Biotechnology**

Students are expected to gain knowledge on microbial processes and activities can be used for development of medically and industrially important products and processes.



## College of Horticulture and Forestry

### **B.Sc. (Horticulture)**

#### **Fundamentals of Horticulture**

Understand various branches of horticulture and their importance and scope, basics and advances of technologies like training, pruning, layout of orchard, understanding the medicinal and pharmaceutical value of different horticultural plants

#### **Tropical and Subtropical Fruits**

The students will be able to understand and practice the production technology aspects including the plant protection measures and post-harvest aspects of various tropical and subtropical fruits

#### **Plant Propagation and Nursery Management**

The student will be able to understand basics of plant propagation and nursery management techniques including preparation of nursery beds, sowing of seeds and recent advances in micropropagation in horticultural crops.

#### **Temperate Fruit crops**

Students will understand the cultivation aspects of temperate fruit crops and their nursery management, training, pruning, plant protection and post-harvest handling of temperate fruits.

#### **Plantation Crop**

At the end of the course, the students will be able to acquire knowledge on various aspects of plantation, spices and condiments including the production technique, diagnose problems and processing of plantation crops

#### **Breeding of Fruit and Plantation Crops**

The student will be able to understand the various breeding methods followed in fruit and plantation crops for development of new improved genotype and will gain hand full skill in hybridization techniques for various fruit crops

#### **Dryland Horticulture**

The student will be able to understand importance, scope, present status and future scope of dry land horticulture including the various techniques and management of dry land horticulture

#### **Orchard and Estate Management**

The students will be to know the basics of layout of orchard and different systems of planting in orchard and various estate management practices followed for good economic return

#### **Tropical and Subtropical Vegetable crops**

The student will be able to gain handful knowledge on the scenario of vegetable cultivation, advanced production technologies, plant protection measures and post-harvest handling of tropical and subtropical vegetable crops.

### **Temperate Vegetable crops**

The student will be able to gain handfull knowledge on the scenario of vegetable cultivation, advanced production technologies, plant protection measures and post-harvest handling of temperate vegetable crops

### **Spices and Condiments**

At the end of the course, the students will be able to acquire knowledge on various aspects including production, protection and processing of spices and condiments

### **Precision Farming and Protected Cultivation**

Students will be able to understand the successful production and management of various horticultural crops under the protected structures and the role of precision farming in improved production of horticultural crops.

### **Breeding of Vegetable, Tuber and Spice Crops**

The student will be able to understand the various breeding methods followed in vegetable, tuber and spice crops for development of new improved genotype and will gain hand full skill in hybridization techniques for various vegetable, tuber and spice crops.

### **Potato and Tuber Crops**

At the end of the course, the students will be able to acquire knowledge on various aspects including production, plant protection and post-harvest handling and storage of potato and tuber crops.

### **Seed Production of Vegetable, Tuber and Spice Crops**

Students will understand the agronomical practices related to seed production of vegetable, tuber and spice crops. Apart they will gain skill post-harvest handling, different stages of field inspection, isolation distances and rouging of vegetable, tuber and spice crops.

### **Postharvest Management of Horticultural Crops**

Most of the horticultural crops being highly perishable in nature; need proper pre- and post-harvest management practices which can be learnt from this course.

### **Processing of Horticultural Crops**

The students will know the importance, scope, principles of fruit and vegetable preservation industry in India, which can also help the students to start their own private venture by establishing their own processing unit.

### **Principles of Landscape Architecture**

At the end of this course, the students will know the various types of gardening, principles associated with lay out and designing of gardening which will help them to design and execute the gardens of their own.

### **Commercial Floriculture**

The student will be able to practice production technology including plant protection measures of various cut and loose flowers, which will help them to establish and manage a commercial floriculture unit.

### **Ornamental Horticulture**

At the end of this course, the students will be able to plan and design the ornamental garden of their own with all the elements of garden and principles.

### **Breeding and Seed Production of Flower and Ornamental Crops**

The student will be able to understand the various breeding strategies including the hybridization techniques and outcome of flower and ornamental crops.

### **Medicinal and Aromatic Crops**

Students will be able to understand the cultivation aspects, advances and developments in production and processing of medicinal and aromatic crops.

### **Introductory Agro-forestry**

The students will be able to understand the importance of agro-forestry as livelihood for the village communities and establishing of tree nurseries.

### **Environmental Studies and Disaster Management**

To students will gain knowledge about the various phenomenon of environment and disasters; causes and the management of these calamities.

## **M. Sc. Horticulture**

### **Production Technology of Warm Season Vegetables**

Students will develop wide practical and theoretical experience regarding warm season vegetable cultivation.

### **Breeding of Vegetable Crops**

Student will be able to understand the breeding strategies i.e., selection, hybridization techniques and breeding procedures, material procurement of vegetable crops.

### **Systematics of Vegetable Crops**

Students will be able to understand Origin, geographical distribution, economic importance, taxonomy, flowering behaviour of vegetable crops.

### **Fundamentals of Processing of Vegetables**

Being vegetable is perishable commodity, this course will help students to understand physiology and biochemistry of vegetable crops. Other than these students will learn about different processing products made through vegetables.

### **Organic Vegetable Production Technology**

Demand of organic vegetables are increasing day by day, by this course students will learn different factors involved in organic vegetables production. Learning organic vegetable production will also motivate students to start their own organic farm.

### **Library and Information Services**

Students will be able to understand different components of library and information services offered by library.

### **Basic Concept in Laboratory Techniques**

Basic concept of laboratory technique will offer a comprehensive understanding of different laboratories and precautions need to be followed, among students.

### **Agricultural Research, Research Ethics and Rural Development Programmes**

Students will be able to understand about agricultural research programmes as well as ethics need to be followed in research

### **Disaster Management**

Students will be able to understand reason and measures need to take during natural calamities

### **Subtropical and Temperate Fruit Production**

Students will be able to demonstrate important production practices and identify problems in tropical and subtropical fruit producing technology. Students will understand the fruit ripening process, grading, packaging, and fruit production economics

### **Breeding of Fruit Crops**

The student will be able to understand the breeding strategies and outcome of fruit and plantation crops. The student will gain skill in hybridization techniques. Students will be familiar with in vitro techniques of fruit crops

### **Post-harvest Technology for fruit crops**

On successful completion of this course, the students will be to understand the post-harvest technology aspects, handling methods, storage methods, packaging and preservation. Gain skill in performing post-harvest operations pertaining to Horticultural products.

### **GAP for Horticultural Crops**

Students will able know the importance and factors involved in good agricultural practices regarding horticultural crops. Students will also come to know sanitation procedure, HACCP, FSSAI regulations needs to be followed in horticultural crops.

### **Growth and Development of Horticultural Crops**

Students will be able to understand basic physiology of horticultural crops, this will include growth and developmental physiology, hormones, and their application in horticultural crops.

## **Organic Horticulture**

By this course students will learn different factors involved in organic fruit production. Learning organic fruit production will also motivate students to start their own organic farm.

## **Intellectual Property and its Management in Agriculture**

Students will be able to understand the concept of intellectual property rights. Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.

### **Technical writing and communication skills**

Students will be able to learn different steps involved in technical writing which will be helpful future scientific writing. Communication skill will help student in building their confidence.

## **Production Technology of Cool Season Vegetable Crops**

Students will be able to demonstrate important production practices and identify problems in Cool Season Vegetable Crops producing technology. They will also understand the grading, packaging, and Cool Season Vegetable Crops production economics.

## **Growth and Development of Vegetable Crops**

Students will be able to understand basic physiology of Vegetable Crops, this will include growth and developmental physiology, hormones, and their application in Vegetable Crops.

## **Seed Production Technology Vegetable Crops**

The students will gain knowledge about the various techniques of quality vegetable seed production, processing and seed quality enhancement. **Production Technology of Underexploited Vegetable Crops**

Students will be able to demonstrate important production practices and identify problems in underexploited Vegetable Crops producing technology. They will also understand the grading, packaging, and Cool Season Vegetable Crops production economics of these crops.

## **M. Sc. Seminar**

Students will demonstrate the ability to perform close and critical readings critically the motives and methods of scholarship and the relationship between them. They will also demonstrate the ability to ask disciplinarily appropriate questions.

## **Ph.D.**

## **Advances in Fruit Production**

Students will gain knowledge on the principles of advance fruit production, propagation techniques of tropical, sub-tropical, temperate fruit crops. Course will also help them to understand major problems of fruit crops.

## **Research Methods in Fruit Production**

Student will be able to understand different methods followed in conducting trails in fruit crops, which includes different statistical methods and laboratory procedures.

### **Post-Harvest Management of Fresh Horticultural Produce**

Students will get to know about different processing techniques of fruits and vegetable crops, and they make value added products like jam, jelly, squash, juice etc.

### **Role of biotechnology in Horticulture, Medicinal, and Plantation Crops**

To impart knowledge on basic and applied aspects of plant biotechnology. student will be able to understand application of plant tissue culture in crop improvement, tackle the problems in convention breeding. Students can also choose; plant tissue culture is an area of entrepreneurship.

### **Advances in Nutrient and Water Management in Fruit Crops**

Students will be able to understand essentiality of plant nutrients and mechanism of nutrient and water transport to plant and factor affecting nutrient availability. Students can establish soil testing laboratory in future as an entrepreneur.

### **Principles of Hi-Tech Production in Horticultural crops**

Students will be able to deal with hi tech production system and can become eligible to carry out technical and management aspects of a protected cultivation, precision farming, geo tagging of horticultural crops.

### **Wasteland Management and Dry Land Horticulture**

Aim of this course to provide knowledge about waste land and dryland soils in India, students will also get knowledge about crops and technologies suitable to these lands.

### **Citriculture**

This course will primarily focus on cultivation, breeding, post-harvest management of citrus crops.

### **Advances in Production of Medicinal & Aromatic and Plantation Crops**

Students will gain knowledge on advances in production, propagation techniques of Advances in Production of Medicinal & Aromatic and Plantation Crops. Course will also help them to understand major problems and choose medicinal and aromatic crops cultivation in future as an entrepreneur.

### **Biodiversity & Conservation of Vegetable Crops**

Studying this course, students will develop an idea of, place of origin, secondary centre of origin and methods of conservation of diversity in vegetable crops.

### **Resistance Breeding in Vegetables**

This course will offer a deep understanding of different breeding methods involved in transferring resistance genes from wild and cultivated genotypes.

### **Research Methods in Vegetable Production**

Student will be able to understand different methods followed in conducting trails in vegetable crops, which includes different statistical methods and laboratory procedures.

### **Advances in Vegetable Production**

Students will gain knowledge on the principles of advance fruit production, propagation techniques of tropical, sub-tropical, temperate vegetable crops. Course will also help them to understand major problems of vegetable crops.

#### **Advances in Breeding of Fruit Crops**

Various advanced breeding techniques involved in fruit breeding i.e., tissue culture, anther culture, shoot tip culture etc. will be taught to students in this course.

#### **Advances in Production of Fruit Crops**

Students will gain knowledge on the principles of advance fruit production, propagation techniques of tropical, sub-tropical, temperate fruit crops. Course will also help them to understand major problems of fruit crops.

#### **Biotic and Abiotic Stress Management in Horticultural Crops**

In changing climate scenario this course will be helpful to students to understand about biotic and abiotic stress affecting horticultural crops. Students will also learn techniques to mitigate these stresses.

#### **Advances in Growth Regulation of Fruit Production**

Various advanced methods utilized in the growth regulation of fruit crops will be dealt in this course.

#### **Research Methods in Fruit Production**

Various methodology including the statistical and laboratory procedures utilized in the research activities related to the fruit production will be dealt in this course.

#### **Advances in Vegetable Production**

In this course various advanced methods of vegetable production like protected cultivation, hydroponic, aeroponics *etc* will be taught to the students.

#### **Advances in Breeding of Vegetable Crops**

Various advanced vegetable breeding tools and methods including the *in vitro* and biotechnological tools will be taught to the students.

#### **Seed Certification, Processing and Storage of Vegetable Crops**

Various processes related to the certification, processing and storage of vegetable seeds for a successful commercial venture will be taught under this course.

#### **Protected Cultivation of Vegetable Crops**

The production and successful management of various on and off season vegetables under different protected structures for higher quality and economic return will be taught and demonstrated *via* this course.

## **Biotechnology of Vegetable Crops**

In this course various classical as well as recent advances in biotechnology related to various aspects of vegetable crops will be taught.

## **Abiotic Stress Management in Vegetable crops**

The students will be able to understand the causes, effects, management and tolerance mechanism of different abiotic stresses *i.e.* salinity, drought, flood, alkalinity, high and low temperature stress in vegetable crops.

## **Silviculture**

The students will be able to understand, the basics, advances and various other aspects related to the practice of silviculture.

## **Productivity of Agroforestry System**

Various agroforestry systems and their productivity for sustainability of environment along with economics of the systems will be taught to the students.

## **Agroforestry System and Management**

Various systems followed in the agroforestry will be taught in this course. Apart, the management practices followed in these systems will also be demonstrated for an economic return.

## **Land use Planning and Watershed Management**

In this course the students will learn to plan about the use of land for various agroforestry systems along with the management of watershed.

## **Advances in Economic Analysis in Forestry**

The students will be able to understand, calculate and predict the economics of various aspects of forestry through this course.

## **Agroforestry System and Management**

Different systems of agroforestry and their management practices for successive economic return will be taught to the students.

## **Forestry Interventions for Environment Amelioration**



Various interventions related to forestry for amelioration of environment will be taught to the students.

### **Doctoral Seminar I**

The student will develop an ability to demonstrate and deliver with fluency on a proposed rational topic related to current burning issue in respected field.

### **Doctoral Seminar II**

The student will develop an ability to demonstrate and deliver with fluency on a proposed rational topic related to current burning issue in respected field.

### **Ph. D. Research**

The student and the chairperson of the advisory committee will be deciding a burning issue of national and international importance as a research topic; the study on this may lead to develop some new technology/ protocol/ process/ genotype or solution to the identified problem.

## College of Fisheries

### **Bachelor in Fisheries Science (B. F. Sc.)**

#### **COF-1 Principles of Aquaculture**

Students learn basic concepts and types of aquaculture such as pond culture, pen culture, cage culture, running water, water quality management, culture practice of freshwater, brackish water and marine water species.

#### **COF-2 Taxonomy of Finfish**

Students are expected to understand identification of fishes and concept about modern taxonomic tools such as karyo-taxonomy, DNA barcoding, protein analysis and DNA polymorphism.

#### **COF-3 Taxonomy of Shellfish**

Students are expected to learn about the basics of fish taxonomy, species suitable for fresh, brackish and marine water aquaculture and their identification, students gain knowledge of fish taxonomy using conventional and molecular methods.

#### **COF-4 Meteorology, Climatology and Geography**

Upscale the basics of shellfish classification to students upraise the knowledge of shell fish classification, skill development to identify cultivable shellfish species of commercial and ecological importance. The basics of fish biology taught will be helpful to understand the biology, limnological aspects of fish culture.

#### **COF-5 Statistical Methods**

Students learn the basics of experimental designs, concepts of population, sample, tests of significance based on Normal, t, and Chi-square distribution, collection of data, analysis and interpretation.

#### **COF-6 Fundamentals of Biochemistry**

Development of skill in students about preparation of normal solution of acid and base, buffers and reagents, qualitative determination of carbohydrates, proteins and lipids. Estimation of total nitrogen and crude protein of fish tissue, carbohydrates in foods, determination of specific gravity of oil, estimation of total lipids in fish tissue, determination of saponification value, iodine value and free fatty acid value. Upraise the knowledge of fundamental of nutrients.

#### **COF-7 Soil and Water Chemistry**

Students learn about the different physico-chemical parameters of water and soil parameters necessary for fish culture like pH, alkalinity, hardness, CO<sub>2</sub> etc. Skill development about

determination of soil texture, water holding capacity, pH, conductivity, organic carbon, nitrogen, phosphorus, lime requirement, soil quality criteria/ requirements for aquaculture.

### **COF-8 Freshwater Aquaculture**

Students learn about the freshwater quality parameters, culture practices of freshwater fish species, prestocking, stocking and post stocking management, paddy cum fish/shrimp culture, economics of different culture practices.

### **COF-9 Anatomy and Biology of Finfish**

Students are expected to understand, fish migration - type and significance, tagging and marking, estimation of fecundity. Study of developmental stages, tagging and marking.

### **COF-10 Limnology**

Students are expected to understand about determination of physical and chemical characteristics of lentic and lotic water bodies, collection and identification of fresh water phytoplankton, biomass estimation of freshwater phytoplankton, estimation of primary productivity.

### **COF-11 Marine Biology**

Students are expected to understand common instruments used for collection of phytoplankton, zooplankton and benthos from sea, analysis of phytoplankton, zooplankton, sea weeds, analysis of inter tidal organisms.

### **COF-12 Inland Fisheries**

Students are expected to understand capture fishery resources of India, fishing crafts and gears. Major riverine and estuarine systems of India, major brackish water lakes and their fisheries. Fisheries of major reservoirs / natural lakes of India. Flood-plain capture fisheries, observations and experimental operations of selected fishing crafts and gears in inland / estuarine waters.

### **COF-13 Food Chemistry**

Students are expected to understand about estimation of moisture, crude protein, fat, ash (including acid soluble) in fish sample, determination of energy value of fish, estimation of glucose and salt content in foods. Colorimetric method of estimation of proteins and carbohydrates, estimation of freshness quality indices such ASM, TVBN, TMA, alpha-amino nitrogen, PV, FFA, TBA value of fish.

### **COF-14 Information and Communication Technology**

Students learn about, exercises on binary number system, algorithm and flow chart; MS Word; MS Excel; MS Power Point; Internet applications: Web Browsing, Creation and operation of Email account, organization of an audio visual programme.

### **COF-15 Aquaculture**

Students learn about management of small, medium and large reservoirs; present status and future prospects in reservoirs fish production. Students expected to understand about fisheries of some important reservoirs; recent advances in reservoirs fisheries management; conservation measures in reservoir fisheries, cage and pen culture in enhancement of fish production from reservoirs. Integration of cage culture with other farming systems, case studies on cage and pen culture; field visit to cage and pen culture site to acquaint with construction details and operation.

### **COF-16 Aquaculture Engineering**

Development of understanding in students regarding site selection and evaluation of potential site for aquaculture. Developments of skills related to land survey – chain surveying, compass surveying, leveling, plane table surveying and contouring; soil analysis for farm construction. Skill development for design and layout plan of fresh water and brackish water farms and hatcheries. Skill development to operate pond aerators and pumps.

### **COF-17 Physiology of Finfish and Shellfish**

Students get basic knowledge regarding finfish and shellfish physiology. Students are also expected to understand about fish reproduction physiology and its role in fish breeding.

### **COF-18 Fish Food Organisms**

Students get basic knowledge related to biology, culture requirements and methodology of important live food organisms. Development of skill to identified various kind of fish food organism such as green algae, blue-green algae, spirulina etc. Skill development for culture of earthworms, bait fish and forage fish. Skill development for culture of selected microscopic live food organisms.

### **COF-18 Fishery Oceanography**

Understanding of basic knowledge of sea and ocean. Students understand of importance and role of waves, currents and tides in ocean. Skill development for operation of oceanographic instruments- Nansen reversing water sampler, Bathythermograph etc. Skill development for measurement and determination of various kind of physico-chemical characteristics of water such as temperature, Transparency, pH, salinity etc.

### **COF-19 Ornamental Fish Production and Management**

Skill development of fabrication, setting up and maintenance of aquarium. Students get basic knowledge of water quality management and related equipments. Development of skill for breeding and rearing of ornamental fishes. Students get knowledge related to common diseases and their control. Skill development to identify common ornamental fishes.

### **COF-20 Freezing Technology**

Understanding of basic concept of chilling of fish – methods and equipment for chilling. Skill development of determination of quality changes during frozen storage and quality assurance of frozen fish, transportation of frozen fish.

### **COF-21 Genetics and Breeding**

Students understand basic knowledge of genetics. Understanding and skill development of chromosome manipulation techniques, cross breeding (hybridization). Design skill development for selective breeding, Inbreeding, seed certification and quarantine procedures. Cryopreservation of gametes. Protocol of androgenesis, gynogenesis and polyploidy.

### **COF-22 Fish Immunology**

Development of understanding to basics of fish immunology. Skill development of serological methods in disease diagnosis. Understanding about methods of vaccine preparation and techniques of fish immunization.

### **COF-23 Fisheries Economics**

Understanding to fisheries-economics such as farm production economics, macroeconomics, Production function. Development of skill for economic analysis on cost, return and breakeven of any two production units like fish farm / shrimp farm / seed production unit etc.

### **COF-24 Aquatic Mammals, Reptiles and Amphibians**

Skill development to identify aquatic mammal, reptile, amphibian and birds species of India relevant to fisheries. Students also learn about the habitat of reptiles and amphibians. They understand the feeding and breeding pattern of all these groups of animals.

### **COF-25 Coastal Aquaculture and Mariculture**

Students get basic knowledge and skill to identify important cultivable fish and shellfish. Development of understanding about shore based aquaculture system: traditional (pokkali, bheries, gazanis, khazans). Skill development in methods of Shellfish Culture rafts, racks, cages, poles and ropes. Skill development in water and soil quality management.

### **COF-26 Therapeutics**

Understanding of antibiotics and its used in aquaculture, Understanding of basic concept of Immuno-stimulants and vaccines-Principles in preparation/formulation, mechanism of action. Skill development for drug formulation and administration for aquaculture.

### **COF-27 Fish Nutrition and Feed Technology**

Skill development for methods of feed formulation and manufacturing. General Knowledge of different forms of feeds: wet feeds, moist feeds, dry feeds, mashes, understanding regarding to basic concept regarding feed additives: binders, antioxidants, enzymes, pigments, growth promoters, feed stimulants. Skill development regarding preparation of artificial feeds using locally available feed ingredients.

### **COF-28 Fish Canning Technology**

Skill development regarding canning process. Skill development regarding principles of thermal processing, estimation of D-value, Z-Value TDT, F-value, lethal rate etc. Development of understanding about quality standards, plant layout, hygiene and sanitation and waste disposal.

### **COF-29 Fish Packaging Technology**

Students are expected to understand about fish packaging and print identification. Skill development to students regarding packaging equipment and machinery. Knowledge and skill development to students related to package design, retort pouch packaging, biodegradable films, vacuum packaging, Labelling and bar coding etc.

### **COF-30 Fish and Shellfish Pathology**

Development of understanding to students about disease development process. Skill development to identify clinical sign in disease diagnosis. Development in expertise of

identification of live and post mortem examination of fish and shellfish. Development of continuous learning process to disease diagnosis and treatment.

### **COF-31 Fishing Craft Technology**

Building of skill in students to understand basic concept of constructional details of Steel, FRP, Ferro Cement and Aluminium boats, outboard and inboard engines. Providing general information of traditional fishing crafts, types of marine engines and their installation of engines.

### **COF-32 Fisheries Extension Education**

Development of understanding in students about social issues/problems through participatory and rapid rural appraisal techniques.

### **COF-33 Shellfish Hatchery Management**

Development of skill to students for induce breeding technique. Skill development to students about hatchery operation and management. Development of skill in brood-stock management and health management.

### **C O F - 3 4 Anatomy and Biology o Shellfish f**

Students are expected to understand about different form of life forms of shellfish with regard to their food and feeding habits, age and growth followed by reproduction and of external and internal organization of commercially important crustaceans and molluscans.

### **COF-35 Pharmacology**

Students learn pharmacodynamics, recent advances in Pharmacology, biostatistics in experimental Pharmacology, Preparation of drug solution, Source and chemical nature of drugs, Incompatibility, Pharmaceutical technology, bioassay of drugs, Animal models in Pharmacological experiments etc.

### **COF- 36 Fish Toxicology**

Students understand the role of toxicants in aquatic ecosystem. They learn the effect of different types of toxic chemicals, students also learn to conduct bioassay of toxic chemicals on aquatic food chain and fishes and mitigation measures necessary to reduce the effect of toxic material.

### **COF-37 Marine Fisheries**

Students are expected to understand about fisheries resources of the world and India, major exploited marine fisheries of India, their developmental history and present status. Important pelagic, - demersal fish, shellfish and seaweed resources of India.

### **COF-38 Fisheries Co-operatives and Marketing**

Students are expected to understand about fisheries co-operative societies, commercial banks and fish markets and organizations dealing with marketing of fish and fishery products.

### **COF-39 Fishing Gear Technology**

Students learn about the different methods for fish captures. Students also learn about the material used for gear construction.

### **COF-40 Fish Population Dynamics and Stock Assessment**

Students understand the principles of stock assessment. Estimation of total fishing and natural mortality, concept of yield, yield in number and yield in weight, yield per recruit, yield curve. Yield models, Maximum Sustainable Yield and Maximum Economic Yield, CPUE. Trawl selection and gillnet selection. Analytical models of fish stocks.

### **COF-41 Coastal Zone Management**

Students are expected to understand about remote Sensing for coastal management, geographical Information System (GIS): Coastal Regulation Zone (CRZ) Act. coastal regulation zones for main land and islands – Environmental policies, planning, administrative and regulations. CRZ mapping. Integrated Coastal Zone Management (ICZM); concept, application and case studies etc.

### **COF-42 Introduction to Biotechnology and Bioinformatics**

Students learn about the application of biotechnology in fisheries. They understand the concept of DNA fingerprinting, bioinformatics, isolation of Nucleic Acids, Restriction enzymes, Gel Electrophoresis, ELISA, DNA sequence analysis and comparison. They also learn about androgenesis, gynogenesis production of sterile population.

### **COF-43 Refrigeration and Equipment Engineering**



The students understand the various methods of fish preservation, drawing of Refrigeration and fish processing machineries plant layout. They also learn about Ice-plant, freezers: design and construction.

### **COF-43 Aquatic Pollution**

**Students are expected to learn about** effect of pollutants on aquatic ecosystem, measurement of the physico-chemical parameters, indicator species and its control.

### **COF-44 Fishing Technology**

Students learn about commercial fishing gears; Trawling: Beam trawling; otter trawling; side trawling; twin trawling out rig trawling bull trawling and mid water trawling. They also learn about constructional of single boat purse seine; two boat purse seine.

### **COF-45 Fish Products and Value Addition**

The students learn about value addition of fishes, they also learn the different types of fish processing methods and quality assessment of market sample of dried and fermented fish products.

### **COF-46 Microbiology of Fish and Fishery Products**

Students learn about the sampling and processing of samples and enumeration for microbiological investigation of fish and fishery products, biochemical tests for characterization of bacteria. Molecular methods for the detection of pathogenic microorganisms.

Students also learn about the potential microbial hazards in fish produce and their prevention methods.

### **COF-47 Navigation and Seamanship**

The students learn about the different navigational systems, they also learn finding of positions and method of positioning of different equipments used in fishing operation. They also learn about the use of different navigational aids in fishing operation.

### **COF-48 Fish By-Products and Waste Utilization**

Students learn the use of different martial produced with the help of fish by-products and wastes. Study of fish meal, fish oil, fish protein concentrate. fish hydrolysate, partially hydrolysed and deodorized fish meat, functional fish protein concentrate and their incorporation to various products. They also learn about the products like mish maws, pearl essence, fish meal etc. Biochemical and pharmaceutical products prepared with the waste and unutilized products.

### **COF-49 Fisheries Business Management and Entrepreneurship Development**

They learn the concept of fish integration, of entrepreneurship, concept of management, Planning, organizing, staffing, leading and controlling. They also study the effect of globalization and the emerging business/entrepreneurial environment.

### **COF-49 Student READY Programme In-plant attachment**

This course includes capacity building and skill development of the students in planning, development, formulation, monitoring and evaluation of project for entrepreneurial proficiency.

### **COF-50 Student READY Experiential Module\***

A minimum of two areas are being decided by each university. Areas of specialization for Experiential Learning Programme are Ornamental fish culture, Seed Production and Aqua farming.

### **COF-51 Microbial and Parasitic Diseases of Fish and Shellfish**

Students are expected to understand and learning about the fish diseases and their types, prevention and treatment of parasitic, bacterial, fungal and viral diseases of finfish and shellfish, OIE listed diseases. Disease surveillance and reporting. Quarantine and health certification in aquaculture. Learning about health management strategies procedures in Aquaculture through different diagnostic procedures such as conventional, molecular and antibody based diagnostic methods and Rapid diagnostic methods.

### **COF-52 Quality assurance of Fish and Fishery Products**

Students learn about Assessment of quality changes in fresh and iced fish, quality changes during processing. Application of HACCP concept in surveillance and quality assurance programmes for fish products, assessment of quality of fresh fish. Quality analysis of canned, frozen, cured and pickled fish products.

### **COF-52 Project Work**

Students learn how to prepare a project plan, students learn how to prepare a project report. They also learn to understand the feasibility of project.

## **M. F. Sc. Courses**

### **COF-1 Statistical Methods**

Students are expected to understand various statistical methods and techniques, data analysis through statistical software such as MS Excel, Systat and SPSS.

### **COF-2 Marine Fisheries Resource Management**

Students are expected to understand about the recent methodologies of sustainable exploitation of renewable resources. Principles of management of fisheries resources.

### **COF-3 Tropical Fish Stock Assessment**

Students are expected to understand the application of various models to estimate fish population.

### **COF-4 Remote Sensing and GIS for Fisheries Management**

**Students learn about** satellite information and its application in fisheries resource management. Study of satellite information, interpretation of satellite pictures for resource management, case studies on remote sensing and GIS applications.

### **COF-5 Modern Techniques in Ichthyo-taxonomy**

Students learn about modern taxonomical tools—Electrophoretic studies (muscle myogen, eyelens protein, enzyme pattern and serology), Karyotyping. Molecular markers—PCR, RAPD, RFLP, Microsatellites, minisatellites and Mitochondrial DNA, and their application in fish phylogenetic studies.

### **COF-6 Inland Fisheries Resource Management**

Students are expected to understand about the recent methodologies of sustainable exploitation of renewable resources. Principles of management of fisheries resources.

### **COF-6 Sustainable Aquaculture**

Students learn about sustainability concept; food security; biosecurity; organic farming; integrated farming; responsible aquaculture; rotational aquaculture; bioremediation; role of biotechnology, traceability. Application of renewable energy in aquaculture - solar energy, wind, and tidal energy, Seed certification, Sustainable use of antibiotics.

### **COF- 7 Nutrition and Feed Technology\***

Students learn about Feed formulation and processing, formulation and preparation of a balanced fish feed; Estimation of protein and lipid quality; Determination of gross energy content of feed and feed ingredients; Determination of the digestibility of feed using markers; Estimation of FCR.

### **COF-8 Seed Production and Hatchery Management of Fin Fishes**

Students learn about seed production and hatchery management of commercial important fishes.

### **COF-9 Seed Production and Hatchery Management of shellfishes**

Students learn about seed production: Seed production of commercially important prawns, shrimps, crabs, lobsters, mussels, edible oysters, pearl oyster, scallops, clams and sea cucumber. hatchery technology and management.

### **COF-10 Aquatic Animal Health Management\***

Students learn about techniques in fish health management: Microbiological, haematological, histopathological, immunological and molecular techniques etc.

### **COF-11 Soil and water quality management in aquaculture\***

Skill development in students about equipments used in soil and water analysis; Soil sampling, determination of soil moisture and bulk density; pond filling, analyses of mud acidity and soil texture; Analysis of Physico-chemical characteristics of soil and water.

### **COF-12 Coastal Aquaculture**

Students learn about different farming systems: Cage and pen culture, Culture of marine molluscs and echinoderms, Culture of crustaceans: Seaweed culture. Integration with other farming systems.

### **COF- 13 Seminar**

The student will develop an ability to demonstrate and deliver with fluency on a proposed rational topic related to current burning issue in respected field.

### **COF-14 Thesis**

## College of Community Science

### **B.Sc. (Community Science)**

#### **Fundamentals of human development**

Student would gain knowledge about scope and importance of study of human development, growth and development, theories of human development.

#### **Life- span development**

By the end of the course the students will be able to understand the different stages of development in different areas.

#### **Marriage and family dynamics**

The students will be able to understand the different concepts related to marriage, different forms of marriage, concept of family life cycle, importance of sex education, aware of the causes for marital dissolution and also aware of different laws related to marriage.

#### **Educational psychology and early education**

Basic information about reinforcement, motivation, discipline on learning, programme planning in ECE, developing and conducting activities to promote all round development.

#### **Family counselling and child welfare**

Student will know the concept, nature, scope, principles and need of family counselling, trust areas in family counselling.

#### **Developmental challenges in children**

Students would be able to understand different concepts of developmental challenges in children, know the need and importance of special education for children with developmental challenges.

#### **Methods and materials for teaching young children**

Student would be able to make different educational materials for teaching young children and ready to teach young children.

#### **Education and counselling of parents and community**

Student will know the need and importance of parent and community education, understanding recent issues and challenges, parent- child relationship and its impact on children, student would be able to educate parents and community.

#### **Early childhood care, education and management**

The student would gain the basic concept of creche, nursery schools, ECCE centers, ECE centers, ECCD centers and able to established their own centers.

### **Developmental assessment of young children**

To appraise the students with different methods and techniques of assessment in human development and expose them to use different assessment techniques throughout life span.

### **Theories of human development and behaviour**

To equip the students with the concepts of theoretical framework of different theories of human development and enable them with a comparative analysis of theories and their educational implications.

### **Advances in life span development and family relatives**

To impart knowledge to students regarding current trends, issues of human development.

### **Gender issues in human developments and family relations**

To let the students, have an understanding about the gender issues faced in the society and to come up with the intervention to solve these.

### **Guidance and counselling**

To acquaint the students about the concept and need of guidance and counselling in human life.

### **Children with developmental challenges**

To orient the students to the etiology and developmental characters of children with developmental challenges and develop in them the sensitivity for working with developmentally challenged children.

### **Appraisal of child and family welfare institution**

To orient the students regarding various child and family welfare institutions and programmes and enable them to understand and develop skills of planning, implementing and evaluating welfare programmes/ institutions.

### **Methods and techniques in human development**

To develop the understanding amongst the students about the methods and techniques used in psychological and psycho-social assessment of human development.

### **Programme development for vulnerable families**

Students are imparted with the knowledge to develop awareness programmes and projects for the upliftment of vulnerable population.

### **Advances in family studies**

To enable the students in gaining the understanding regarding various approaches and frameworks related to family and techniques used in family therapy.

### **Women's studies**

To orient the students in understanding the problems and issues faced by women in current scenario.

### **Principles and strategies in developmental intervention**

To make the students aware about significance and strategies of imparting intervention.

## **M.Sc. Community Science**

### **Course outcome of Textile Science and Design:**

#### **Textile science and fabric care**

To enable the students with the knowledge of different fibres, yarns and their processing in reference to testing, properties and caring.

#### **Fundamentals of clothing construction**

To enable the students with the technical know-how of cutting and stitching by using different tools and equipments.

#### **Techniques of fabric construction**

To provide the students with deep knowledge about weaving and knitting techniques with emphasis on its various components.

#### **Textile finishes**

To give exposure to the students regarding the classification of textile finishes and their application on different fabrics.

#### **Garment and accessory designing**

To help the students in development of different garments and accessories by using various constructional techniques used for designing.

#### **Traditional textiles and costumes of India**

To impart deep knowledge about traditional textile and costumes of each state of India.

#### **Retailing and merchandising- textiles and apparel**

To give exposure about fashion industry through giving an insight about retailing and merchandising.

### **Apparel designing technique- flat pattern and draping**

To establish the usage of flat pattern making and draping as prominent apparel designing techniques amongst the students.

### **Principles of textiles designing**

To help the students in gaining an understanding about the elements and principles used in textile designing.

### **Fashion illustrations**

To enhance creative skills in the students by imparting the know-how of fashion sketching and illustrations.

### **Computer aided designing- pattern designing**

To build up designing skills in the students by using computer based software such as Corel DRAW, Photoshop etc.

## **Course outcome of Extension Education and Communication Management:**

### **Extension and rural development**

The students will be able to understand the basics of extension education and sociology like its meaning, principles and objectives, various rural development programmes and their objectives and how to mobilize community.

### **Programme development for rural families**

The student would gain detailed knowledge about programme planning, its implementation as well as evaluation and in depth understanding of leadership.

### **Introduction to rural sociology**

Basics of rural sociology, knowledge about Indian rural institutions and status of women in India.

### **Print and electronic journalism**

Students would gain knowledge about different media in the current scenario, photography and its equipment, familiarize with different online articles and journals.

### **Public relation and social marketing**



Students will know the skills for building public relation and need of social marketing for the development of people and change in their behaviour and they would also able to analyse the social problems in their community.

### **Seminar**

To enable students to make power point presentation and develop confidence to present and they will also able to work on specific topic by having its in-depth study.

## **Course outcome of Food Science and Nutrition**

### **Principles of human nutrition**

Students will enable to design and critique evidence-based nutrition intervention for prevention and control of chronic diseases and familiarize nutritional assessment, RDA & Recommendations and guidelines.

### **Food science and processing**

To help the students in understanding the techniques that can be used to monitor quality of raw ingredients and final products.

### **Normal and therapeutic nutrition**

To acquire the skills and techniques involved in planning and preparation of therapeutic diets for various ailments.

### **Clinical nutrition and dietetics**

To acquire the knowledge of modification of normal diet for therapeutic purposes.

### **Food analysis**

To independently set up and execute standard laboratory methods and techniques for chemical analysis of food commodities.

### **Community nutrition and education**

To enable students to educate others about holistic nutrition, lifestyle, wellness and healthy living and to gain knowledge on changes during various stages of growth and development throughout lifecycle.

### **Fundamentals of food microbiology**

Students will enable to understand about morphological characteristics of different microorganism associated with food.

### **Food and nutrition policy and agriculture**

To enables students to educate others about role of government and non-government programs and policies related to nutrition and agriculture.

### **Food hygiene and sanitation**

Students will able to know about the spoilage and factors affecting the growth of microorganisms in food.

### **Elementary human physiology**

Students will able to gain the knowledge on different parts of the body and also know about parts of the body and its diseases and disorders.

### **Diet and nutrition counselling**

Evaluate the patient's medical records and interpret their medical history related to the conditions

### **Food preservation and storage**

Student will enable to extend shelf life of different food product by using the various methods of food preservation techniques and process.

### **Food service and hospitality management**

To enable students to know and implement safety and sanitation measures within the restaurant and food service industry.

### **Nutraceuticals and health foods**

Students will be able to recognize the structure of the major bio- active food constituents that are being incorporated into functional food, physiological and functional basis of various photochemical compounds of natural as well as synthetic compounds.

### **Advances in community nutrition**

To enables the students to assess the nutritional status of the community and also addressing the nutritional problems in the community through proper evaluation.

### **Food product development**

Students will able to develop ability to apply and adapt novel technologies to real life innovative products and process.

### **Advanced food science**

Students will able to understand the novel and innovative food sciences and emerging technologies.

### **Advanced nutrition**

To help the students in understanding the physiological and metabolic functions of nutrients.

### **Food analysis**

To acquire knowledge in qualitative and quantitative estimation of nutrients present in agricultural commodities.

### **Nutrition during life cycle**

To gain knowledge on physiological changes in relation to food and nutrition during various stages of growth and development of human life.

### **Advanced diet therapy**

To impart knowledge to the students about nutritional care and diet therapy to be given in special conditions and various metabolic disorders.

### **Advances in carbohydrates, proteins and lipids**

To enable students to gain-in- depth knowledge of the physiological and metabolic role of macronutrients and their importance in human nutrition.

### **Advances in vitamins and hormones**

To give an exposure to the students about the recent advances in the studies of vitamins and minerals.

### **Minerals in human nutrition**

To let the students gain the knowledge about the requirement, functions and metabolic changes caused by minerals and trace elements in human life.

### **Nutrition in emergencies**

To understand and develop interventions for solving the nutritional crisis that arise during emergencies.

### **Global nutritional problems**

To understand nutritional problems faced by vulnerable groups across the globe and to develop strategies and programmes which could help in overcoming these.

### **Maternal and child nutrition**

To impart knowledge about the importance of nutrition during pregnancy, lactation and early childhood years.

### **Course outcome of Family Resource Management:**

### **Fundamentals of art and design**

The course will equip the students with the knowledge of designing interior, development of motif and design through art principles.

### **Financial management and consumer education**

The student will learn major aspects of family finance, credit, savings and investment institution and to make them aware about consumer rights and responsibilities.

### **System dynamics and management of resources**

To guide management of household resources, money management and budget controlling.

### **Ergonomics and appropriate technologies**

To make the students understand that ergonomic methods give assistance in the work simplification, reduction of energy consumption in household as well as drudgery reduction in farm and community.

### **Entrepreneurship development and business management**

To develop entrepreneurial skills of students by planning, implementing and managing enterprises and production processes.

### **Residential and commercial space design**

To make students understand the building bye laws, design and space organization analysis of independent house of apartments, flats and commercial buildings.

### **Housing and space management**

To give exposure to students about housing plan, policies and housing schemes.

### **Event management**

The students will learn to conduct event and generate income by organising different events of social academic work.

### **Interior design and decoration**

Students will learn latest Interior designing trends as well as traditional trends to innovate new ways of interior designing decision.

### **Computer added interior design**

It will help student to be gain great creative skills and develop good designs in interior house plan etc.

### **Resource management principles and practices**

Student will be able to plan, control and evaluate the family resource to achieve goals.

### **Human factors and ergonomics**

Student will be able to identify ergonomics and processes in reducing discomfort and muscular problem in human errors to avoid drudgery

### **Trends in resource management**

This will enable the students to know and understand all the trends from classical to modern and manage them effectively in order to achieve the objectives.

### **Approaches in resource management**

To acquaint the students with the concepts of management which are applicable to families.

### **Advance housing**

To acquaint students with various building techniques, vastu shastra, acoustics, rain water harvesting and landscape planning.

### **Advanced interior space management**

To make students understand new dimensions of interior designing and to acquaint them with latest trends in decoration treatment for interiors.

### **Consumer communication media**

To give deep knowledge to the students about the trends and impact of communication media on consumers.

### **Consumer guidance and counselling**

To provide knowledge and skill to the students related to consumer protection for rational consumer behaviour.

### **Consumer ergonomics**

To impart knowledge about human behaviour with reference to ergonomic system and its impact on drudgery reduction.

### **Consumer issues and challenges**

To acquaint the students about various consumer issues related to products and services in rural and urban context.

### **Advances in resource management**

To expose students to classical and neo-classical approaches to scientific management.

### **Occupational biomechanics**

To acquaint students about occupational hazards and advances in ergonomics for enhancing job fitness compatibility.

### **Globalization and consumer economics**

To develop a preview into major economic problems into the country and relate one's role in solving the problems of the consumers.

### **Family dynamics and women power**

To create awareness among students about change in role of women and propose strategies for development and protection at work.

### **Consumer product design**

To develop skills among students in computer aided designing of products.

### **Environmental issues and challenges**

To expose students to global environmental issues and strategies to maintain ecological balance in environment.

## **B. Tech (Agricultural Engineering)**

### Engineering Mathematics-I, II and III

Student will learn different mathematical methods which will help them to solve different problems in field for ex. matrix Reduction to normal form, consistency and solution of linear equations, Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of matrices, etc

### Engineering Physics

Students are trained in engineering physics to understand properties and behavior of different agricultural materials e.g. error analysis in Physics Laboratory, determine the frequency of AC mains with the help of sonometer, determine the wavelength of sodium light by Newton's rings method, etc.

### Engineering Chemistry

Students study the chemical properties of different agricultural materials using alkalinity in given water sample by volumetric method, hardness of water sample by EDTA method, dissociation constant of weak acid using PH – Meter, maximum Wavelength of Absorption of  $\text{FeSO}_4$ , to Verify Beer's Law, etc.

### Principles of Soil Science

Students are expected to learn basics of soil science which will help them to produce proper soil conditions for cultivation using determination of organic carbon of soil, determination of Nitrogen, determination of Phosphorus, determination of Potassium, etc.

### Surveying and Leveling

Students will have complete knowledge about to mark the excavation lines, centre lines of all the columns of the plan of a proposed building on the actual site of work as per plan of the building to facilitate earth cutting, setting out a simple circular curve in the field by a linear method and checking it by an angular method, etc.

### Engineering Mechanics

Students are expected to learn Verification of reciprocal theorem of deflection using a simply supported beam, deflections of truss-horizontal deflections & vertical deflections of various joints of a pin-jointed truss, elastic displacements (vertical & horizontal) of curved members, etc.

## Engineering Drawing

Students study the principles of orthographic projections; Reference planes; Points and lines in space and traces of lines and planes; Auxiliary planes and true shapes of oblique plain surface; True length and inclination of lines; Projections of solids (Change of position method, alteration of ground lines), etc.

## Principles of Horticultural Crops and Plant Protection

Students are expected to learn identification and description of important fruits, flowers and vegetable crops, study of different garden tools, preparation of nursery bed, practices of pruning and training in some important fruit crops, etc.

## Principles of Agronomy

Students will have complete knowledge about identification of crops and their varieties, seeds, manures, fertilizers and weeds, fertilizer application methods, different weed control methods, practice of ploughing, practice of puddling, etc.

## Communication Skills and Personality Development

Students study the listening and note taking, writing skills, oral presentation skills, field diary and lab record, Indexing, footnote and bibliographic procedures, etc.

## Soil Mechanics

Students are expected to learn about determination of water content of soil, determination of specific gravity of soil, determination of field density of soil by core cutter method, determination of field density by sand replacement method, etc.

## Design of Structures

Students will have complete knowledge about design and drawing of single reinforced beam, double reinforced beam, design and drawing of steel roof truss, design and drawing of one way, two way slabs, etc.

## Thermodynamics, Refrigeration and Air Conditioning

Students study about the domestic water cooler, domestic household refrigerator, absorption type solar refrigeration system, cold storage for fruit and vegetables, etc.

## Electrical Machines and Power Utilization

Students are expected to learn about D.C. motor starters, to perform load-test on 3 ph. induction motor & to plot torque V/S speed characteristics, etc.



### Auto CAD Applications

Students will have complete knowledge about application of computers for design, CAD-Overview of CAD window – Explanation of various options on drawing screen, study of draw and dimension tool bar, practice on draw and dimension tool bar, etc.

### Applied Electronics and Instrumentation

Students study about the V-I characteristics of p-n junction diode, half wave, full wave and bridge rectifier, to study transistor characteristics in CE configurations, design and study fixed and self-bias transistor, etc.

### Tractor and Automotive Engines

Students are trained in different systems of CI engines, engine parts and functions, working principles etc, Valve system – study, construction and adjustments, Oil & Fuel determination of physical properties; Air cleaning system; Fuel supply system of SI engine, etc.

### Watershed Hydrology

Students will have complete knowledge about meteorological observatory and study of different instruments, design of rain gauge network, intensity - frequency - duration curves, depth - area - duration and double mass curves, analysis of rainfall data and estimation of mean rainfall by different methods, etc.

### Irrigation Engineering

Students study about the measurement of soil moisture by different soil moisture measuring instruments, measurement of irrigation water, measurement of infiltration characteristics, determination of bulk density, field capacity and wilting point, estimation of evapotranspiration, etc.

### Sprinkler and Micro Irrigation Systems

Students are expected to learn about study of different components of sprinkler irrigation system, design and installation of sprinkler irrigation system; determination of precipitation pattern, discharge and uniformity coefficient, cost economics of sprinkler irrigation system, etc.

### Fundamentals of Renewable Energy Sources

Students will have complete knowledge about different types of solar cookers, solar water heating system, natural convection solar dryer, solar PV, etc.

## Engineering Properties of Agricultural Produce

Students study about the determination of the shape and size of grains, fruits and vegetables, determination of bulk density and angle of repose of grains, determination of the particle density/true density and porosity of solid grains, etc.

## Tractor systems and control

Students are expected to learn about transmission systems and components, study of clutch functioning, parts and design problem on clutch system, study of different types of gear box, calculation of speed ratios, design problems on gear box, etc.

## Farm machinery and equipment-I & II

Students will have complete knowledge about different farm implements and tools. Study of hitching systems, problems on machinery management, study of primary and secondary tillage machinery – construction, etc.

## Agricultural structures and environmental control

Students study about the design and layout of a dairy farm, poultry house, goat house/ sheep house, design of a farm fencing system, feed/fodder storage structures, etc.

## Post harvest Engineering of Cereals, Pulses and Oil Seeds

Students are expected to learn about performance evaluation of different types of cleaners and separators, Determination of separation efficiency, study of different size reduction machines and performance evaluation, determination of fineness modulus and uniformity index, etc.

## Soil and water conservation engineering

Students are expected to learn about different types and forms of water erosion, computation of rainfall erosivity index, soil erodibility index in soil loss estimation, determination of soil loss by USLE and MUSLE, etc.

## Watershed planning and Management

Students study about the surveying and preparation of watershed map, quantitative analysis of watershed characteristics and parameters, etc.

## Drainage Engineering

Students will have complete knowledge about In-situ measurement of hydraulic conductivity by single auger hole and inverse auger hole method, estimation of drainage coefficients; installation of piezometer and observation wells, etc.

## Renewable Power Sources

Students are expected to learn about performance evaluation of solar water heater; solar cooker; Characteristics of solar photovoltaic panel, evaluation of solar air heater/dryer, etc.

### Skill Development Training-I (Students READY)-Registration only

Students are exposed to the real –time problems faced in the field of Agricultural Engineering. It helps students to understand the practical applications of tools and techniques which they have studied in their curriculum to real-time problems.

### Computer Programming and Data Structure

Developing and executing simple programs, developing program using loop statements while, do & for; using nested control structures, etc.

### Post Harvest Engineering of Horticultural Crops

Students study about the performance evaluation of peeler and slicer, juicer and pulper, blanching equipment, testing adequacy of blanching, etc.

### Water Harvesting and Soil Conservation Structures

Study of different types of farm ponds, computation of storage capacity of embankment type of farm ponds, etc.

### Ground Water, Wells and Pumps

Students are expected to learn about verification of Darcy's Law; study of different drilling equipments; sieve analysis for gravel and well screens design, estimation of specific yield and specific retention, etc.

### Tractor and Farm Machinery Operation and Maintenance

Students study about the different makes and models of agricultural tractors. Identification of functional systems including fuels system, cooling system, transmission system, steering and hydraulic systems, etc.

### Dairy and Food Engineering

Students will have complete knowledge about pasteurizers, sterilizers, homogenizers, separators, butter churns, evaporators, etc.

### Bio Energy System, Design and Application

Students study about the anaerobic fermentation system for industrial application, gasification for industrial process heat, biodiesel production unit, etc.

### Precision Farming Techniques for Protected cultivation

Students study about the estimation of material requirement for preparation of root media, root media preparation, bed preparation and disinfections, study of different planting techniques, design and installation of irrigation system, design and installation of fogging system, etc.

### Floods and control Measures

Students study about the flood stage-discharge relationship in a watershed, determination of flood peak-area relationships. Determination of frequency distribution functions for extreme flood values using Gumbel's method.

### Human Engineering and Safety

Students study about the use of Heart Rate Monitor. Study of general fatigue of the subject using Blink ratio method, Familiarization with electro-myograph equipment, anthropometric measurements of selected subjects.

### 10 Weeks Industrial Attachment / Internship (Student-READY) I & II

Build work related skills required for the business environment through constructive feedback and supervision

### READY Skill Development training-II

Students are expected to learn about to enhances the proficiency of a person in any particular area, it helps to enhances overall job satisfaction.

### Educational Tour

Field trips help students to interact with what they are learning

### Project Planning and Report Writing

Students are expected to boosts project performance and success rates, project planning involves comprehensive mapping and organizing of project goals, tasks, schedules, and resources before anyone assigns roles for the project and the team begins to execute the plan.

## B. Tech (Computer Science & Engineering)

### Engg Chemistry-I & II

Students study to determine the Ferros content in supplied sample using external indicator, chloride content in water using Mohar's salt, Kinetics of hydrolysis of methyl acetate, iron content in water sample by spectrophotometry, etc.

### Solid Mechanics

Students study about the Direct Tension Test, Torsion Test, Hardness Test, Brinell's Hardness Test Rockwell Hardness Test, etc.

### Physics-I & II

Students study variation in potential drop with the length of a wire for a steady current, To draw the diagram of a given open circuit comprising at least a battery, resistor/rheostat, key, ammeter and voltmeter, etc.

### Thermodynamics & H. E

Students study about the calibration of Bourden Tube Pressure Gauge, to investigate the first law and second law of thermodynamic using heat engine. To investigate the relation between pressure and temperature of Saturated Steam using Marcet Boiler. Etc

### Introduction to computer & Programming

Write program to calculate addition, subtraction, multiplication, division using Fortran, Write program to calculate Fibonacci series, factorial, calculator program. Etc.

### Work Program

Students are exposed to performing employees develop their leadership abilities. Organizations who show a commitment to their employees' development will gain a reputation as a desirable place to work.

### Engineering Mathematics-I, II and III

Student will learn different mathematical methods which will help them to solve different problems in field for ex. matrix Reduction to normal form, consistency and solution of linear equations, Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of matrices, etc

### Engineering Drawing

Students study the principles of orthographic projections; References planes; Points and lines in space and traces of lines and planes; Auxiliary planes and true shapes of oblique plain surface;

True length and inclination of lines; Projections of solids (Change of position method, alteration of ground lines), etc.

### Workshop Practice

Students study the Forging tools and equipment and safety precautions, Fitting tools and equipment-use of v block, marking gauge height gauge, Carpentry tools and wood working, etc.

### Technical writing

Students are exposed to Listening comprehension-Ear-training, use of latest scientific techniques A V R., Comprehension Trainer, S.A.R comprehension Accelerator A. V.R. comprehension, etc.

### Digital logic & circuit

Students study about to implement AND, OR, NOT gates, implement NOR, XOR, XNOR gates. Flip flop and convert flip flop (JK to RS and RS to JK, D to T and T to D flip flop) using Breadboard, etc.

### Data Structure

Students are exposed to write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements, read the two arrays from the user and merge them and display the elements in sorted order.

### Discrete Structure

Students are exposed to write a program to calculate factorial of a number, to calculate sum of first n natural numbers where n is finite. To create two sets and perform the Union operation on sets.

### Formal Languages and automata theory

Students are exposed to Nondeterministic Finite Automata (NFA), to convert DFA to NFA, and NFA to DFA using J FlAp software.

### Computer Graphics & Animation

Students are expected to draw the following basic shapes in the center of the screen: Circle, Rectangle, Square, Concentric Circles, Ellipse, Line, etc.

### Circuit Theory

Students study the Verification of Kirchhoff's current law and voltage law using hard ware and digital simulation, Verification of mesh analysis using hard ware and digital simulation.

## Instrument and Measurements

Students study the blockwise construction of an analogue oscilloscope & function generator, blockwise construction of a multimeter & frequency counter. To study measurement of different components and parameters like  $Q$  of a coil using LCR  $Q$ -meter.

## N.S.S

Develop among themselves a sense of social and civic responsibility. Identify the needs and problems of the community and involve them in the solution of problems

## Microprocessor

Students are exposed to write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers. To perform multiplication and division of two 8-bit numbers using 8085.

## Data processing and file system

Students are exposed to write program to convert decimal to binary, binary to decimal, binary to octal, octal to binary, binary to hexadecimal, hexadecimal to binary using C programming.

## Computer organization

Study of peripherals, components of a Computer System, Binary Addition, Binary Multiplication, Booth's Multiplication algorithm, Restoring Division.

## Electronic Devices & circuits

Students are exposed to V-I Characteristics of Zener Diode and Zener Regulator Characteristics. V-I Characteristics of LED, Half-Wave Rectifier with and Without Filter, etc.

## System Programming

Students are exposed to implement a symbol table with functions to create, insert, modify, search, and display. Implement pass one of a two pass assembler. Implement pass two of a two pass assembler.

## Programming Languages

Students will have complete knowledge about to Create an abstract data type 'Stack of Integers' and the operations PUSH and POP that insert and delete elements in a stack in a language of your choice.

## Fundamental Computer communication system

Study of different types of network cables and practically implemented the cross-wired cable and straight through cable using clamping tool.

### Data Base management system

Students study about the design SQL query for arithmetic operations command, Design SQL query for logical operator's command, Design SQL query for relational operator's command, etc.

### Control System

Students will have complete knowledge about ON/OFF Temperature Control system, Step response of second order system, Characteristics of AC Servomotor, etc.

### State of the Art computer

Students are expected to learn about design and implementation of various logic gates using NAND gate, Design and implementation of Binary Adder (Half and Full).

### Management information systems

Students are expected to learn about flowchart and distinguish between the main kinds of flowchart used in data processing.

### Multimedia Technology

Students will have complete knowledge about study of Multimedia Hardware of Multi Media Technology, study of Multimedia Software of Multi Media Technology, etc.

### Project-A

Students will learn to develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.

### Seminar

This one credit course is meant to give students practice speaking in front of an audience and to explore topics of their own choosing in detail.

### Microprocessor Based System

Students study about the to perform multiplication and division of two 8 bit numbers using 8085, to find the largest and smallest number in an array of data using 8085 instructions set, and to write a program to arrange an array of data in Ascending and descending order.

### Numerically Controlled Machines & Robotics

Students are expected to learn about CNC and DNC machine, Computer Aided Manufacturing, Adaptive Control & Programmable Logic Controller, etc.



## Operating Systems

Students will have complete knowledge about WAP to implement First Come First Serve (FCFS) Scheduling, WAP to implement shortest job first (SJF) scheduling, etc.

## Practical Training

Students are expected to learn new things, get technical skill, to achieve ability of entrepreneurship, etc.

## Mobile computing

Students are exposed to the study of technical challenges of Mobile Computing, Mobile Network Architecture and study of IEEE 802.11 protocol architecture and IEEE 802.11 layers & functions.

## Image Processing

Students study about write a program for image enhancement, write a program for image compression and Image Restoration, etc.

## Data Mining & ware housing

Students are expected to Data Processing Techniques: Data Cleaning, Data Transformation Normalization, Data Integration, etc.

## Project

To train the students in preparing project reports and to face reviews and viva-voce examination, Project work is envisaged to train a student to analyze independently any problem posed to him/her.

## **B.Tech. Mechanical Engineering**

### Engg. Chemistry-I & II

Students study to determine the Ferros content in supplied sample using external indicator, chloride content in water using Mohar's salt, Kinetics of hydrolysis of methyl acetate, iron content in water sample by spectrophotometry, etc.

### Solid Mechanics

Students study about the Direct Tension Test, Torsion Test, Hardness Test, Brinell's Hardness Test Rockwell Hardness Test.

## Physics-I & II

Students study variation in potential drop with the length of a wire for a steady current. To draw the diagram of a given open circuit comprising at least a battery, resistor/rheostat, key, ammeter and voltmeter, etc.

## Thermodynamics & H. E

Students study about the calibration of Bourden Tube Pressure Gauge, to investigate the first law and Second law of thermodynamic using heat Engine. To investigate the relation between pressure and temperature of Saturated Steam using Marcet Boiler. Etc

## Introduction to computer & Programming

Write program to calculate addition, subtraction, multiplication, division using Fortran, write program to calculate Fibonacci series, factorial, calculator program, etc.

## Work Program

Students are exposed to performing employees develop their leadership abilities. Organizations who show a commitment to their employees' development will gain a reputation as a desirable place to work

## Engineering Drawing

Students study the principles of orthographic projections; References planes; Points and lines in space and traces of lines and planes; Auxiliary planes and true shapes of oblique plain surface; True length and inclination of lines; Projections of solids (Change of position method, alteration of ground lines), etc.

## Workshop Practice

Students study the Forging tools and equipment and safety precautions. Fitting tools and equipment-use of v block, marking gauge height gauge, carpentry tools and wood working.

## Technical writing

Students are exposed to Listening comprehension-Ear-training. Use of latest scientific techniques-A V R., Comprehension Trainer, S.A.R comprehension Accelerator A. V.R. comprehension.

## N.S.S

Develop among themselves a sense of social and civic responsibility. Identify the needs and problems of the community and involve them in the solution of problems.

### Internal Combustion Engines

Students study of 2, 4-stroke petrol engine diesel engine, Morse test on a multi cylinder petrol engine, bomb calorimeter, etc .

### Basic Electronics

Students are exposed to find the frequency response of given (RC coupled) Amplifier and calculate its bandwidth logic gates (NAND, NOR, EX-OR, AND, OR, NOT).

### Principles of Electrical Engineering

Students are exposed to Measurement of current, power and power factor of incandescent lamp, fluorescent lamp, and LED lamp. Measurement of resistance and inductance of a choke coil using 3 voltmeter methods.

### Material Science

Students study Quantitative and qualitative analysis of microstructure using optical microscopy and scanning electron microscopy.

### Fluid Mechanics

Students study to Verify continuity equation. Bernoulli's equation, Calibration of rectangular notch, Calibration of V –notch, Determination of metacentric height, etc.

### Programming in Fortran & C

Students are exposed to write a basics of C program and Fortran

### Kinematics of Machines

Students study of different types of belt drive, governors, gear Trains, cam and follower arrangement, plot follower displacement Vs cam rotation graph for various cam follower.

### Strength of materials

Students study about the Direct Tension Test., Torsion Test, Hardness Test, Brinell's Hardness Test Rockwell Hardness Test.

### Heat and Mass Transfer

Students are exposed to determine the thermal conductivity of the given metal rod, composite wall. natural convection and forced convection, surface heat transfer co-efficient 'h' for a horizontal tube losing heat by forced convection, etc

### Fluid Machinery & system-I & II

Students study the performance characteristics of a centrifugal pump and determine the characteristic with maximum efficiency. Conduct load test on Pelton wheel turbine and study the characteristics of Pelton, etc.

### Refrigeration and Air Conditioning

Students study about the domestic water cooler, domestic household refrigerator and Air Conditioning units, absorption type solar refrigeration system, cold storage for fruit and vegetables, etc

### Theory of Machines

This course helps to understand about the different type of mechanism, kinematics and dynamics of machine. To plot follower displacement Vs cam rotation graph for various cam follower arrangement.

### Power plant engineering and energy conversion

Under this course students learn about the different type of power generation cycle, thermal power plant, nuclear power plant

### Machine Design-I & II

Under this course students learn about the terminology of gears, procedure of spur and helical gears design procedure of bevel gear and worm gears, different types of bearing. Journal bearing, etc.

### Computer aided Design

This program helps to learn draw 2D and 3D models, the isometric drawings by using AutoCAD 2D commands and the Dimensions can be determined by counting the No of grids.

### Automobile Engineering

Students expose to Demonstration of Layout of an automobile, differential gear mechanism of rear axle, Clutches, Braking System, Steering Mechanism, etc.

### Project

To train the students in preparing project reports and to face reviews and viva-voce examination, Project work is envisaged to train a student to analyze independently any problem posed to him/her.

### Manufacturing Process

This course helps to understand the different type of operation such as casting, metal cutting, surface finishing, cold working, hot working etc operations.

### Theory of fluid flow

Students study to Verify continuity equation. Bernoulli's equation, Calibration of rectangular notch, Calibration of V –notch, Determination of metacentric height, etc.

### Machine Drawing

Students study the principles of orthographic projections of machine elements; References planes; Points and lines in space and traces of lines and planes; Auxiliary planes and true shapes of oblique plain surface; True length and inclination of lines; Projections of solids (Change of position method, alteration of ground lines), etc.

### Measurement & Control

Students study about the different types of measuring instruments. Different types of transducers, Strain- gauge working and principle, LVDT working and principle, etc

### Numerical Methods for Mechanical Engineers

Students introduce to MATLAB, Determination of polynomial using method of least square curve fitting, Newton Rapson method etc.

### Mechanical Vibrations

Students exposes to determine the natural frequency of undamped torsional vibration of a single rotor shaft system, frequency of undamped free vibration of an equivalent spring mass system, etc.

### Production Engineering

This course helps to understand the different type of operation such as casting, metal cutting, surface finishing, cold working, hot working etc operations, etc.

### Practical Training

Students are exposed to the real –time problems faced in the field of Mechanical Engineering. It helps students to understand the practical applications of tools and techniques which they have studied in their curriculum to real-time problems.

### Bearing and Lubrication

Students study about bearings and its classifications. Lubricating oils and its properties, design procedure of hydrostatic bearing, design procedure of hydrodynamic bearing, etc.

### Non-conventional energy sources & system

Students will have complete knowledge about different types of solar cookers, solar water heating system, natural convection solar dryer, solar PV, etc.

## Fuels and Combustion

Students study about the different types of fuels, the flash and fire point of the liquid fuels, gasification for industrial process heat, biodiesel production unit, etc.

## Seminar

This one credit course is meant to give students practice speaking in front of an audience and to explore topics of their own choosing in detail.

## **M. Tech. Agricultural Engineering**

### Watershed Hydrology

Students study about the Rainfall analysis, runoff computation, construction of hydrographs, delineation of watershed, hydrograph analysis, reservoir and channel routing, etc

### Soil and Water Conservation Engineering

Students exposes to design of drop spillway, chute spillway, drop inlet spillway, hydraulic jump, calculation, design of bench terrace, contour bunds and contour trenches

### Agricultural Drainage System

Students are exposed to measurement of in-situ hydraulic conductivity. Estimation of drainage coefficient and leaching requirements. Delineation of waterlogged areas through isobar, isobaths and topographic maps, etc.

### Statistical Methods

Students study about Probability distribution (Poisson Probability and normal probability), correlation & regression analysis, Multiple regression analysis, Simple random sampling with and without replacement technique, etc.

### Sediment Transport

Students will have complete knowledge about field investigation & survey, study of movement of sediment, regression model for sedimentation yield estimation sediment losses, etc.

### Ground Water Engineering

Students study about water table contour maps and determination of groundwater flow, estimation of aquifer characteristics, problems on non leaky and leaky aquifers, etc.

### Land Development and Earth Moving Machinery

Students are exposed to study of land clearing machinery, study of earth moving machinery mechanics of earth moving machinery mechanisms of crawler mounted tractors, earth diggers, Bulldozers and scrapers, etc.

### GIS and Remote Sensing for Land and Water Resources Management

Familiarization with remote sensing and GIS hardware, software and their principle of working. Methods of establishing ground truth, Comparison between ground truth and remotely sensed data. Application of GIS packages, etc.

### Master's Seminar

To explore new research from a range of academic disciplines which sheds light on the outlined questions? To showcase cutting edge research on education and culture from outstanding academic researchers.

### Master's Thesis Research

The purpose of a thesis is to enable the student to develop deeper knowledge, understanding, capabilities and attitudes in the context of the programme of study. It offers the opportunity to delve more deeply into and synthesize knowledge acquired in previous studies.