

UNDER GRADUATE PROGRAM B.Sc. (Hons.) AGRICULTURE

(As per the recommendation of ICAR 4th Deans Committee)

Old credits = 183
New credits = 200

Semester I

Sr. No.	Course Code	Course Title	Credit hrs.
1.	CHEM-300	General Chemistry (Org., Inorganic and physical)	3(2+2)
2.	MVE – 301	Moral & Value Education	2(2+0)
3.	PSY – 302	Human Development, Professional Ethics and Personality Development(New Course Code)	1(1+0)
4.	MAS-303	Mathematics - I	2(2+0)
5.	CSIT – 301	Introduction to Computer Application	2(1+2)
6.	AGRN – 311	Principles of Agronomy(New)	3(2+2)
7.	AGRN – 312	Introductory Agriculture (Ancient Heritage, Agricultural Scenario and Gender Equity in Agriculture)	1(1+0)
8.	HORT – 313	Fundamental of Horticulture	3(2+2)
9.	PPR – 314	Plant Pathogens and Principles of Plant Pathology	3(2+2)
10.	SES – 315	Principles Soil Science (New)	3(2+2)
		Total Credit	23 (17+12)

Total Classes = 29

Semester II

Sr. No.	Course Code	Course Title	Credit hrs.
1.	MAS – 304	Mathematics - II	2(2+0)
2.	AEAB – 321	Principles of Agricultural Economics (Course Code Changed)	2(2+0)
3.	EXT – 322	Dimension of Agricultural Extension	3(2+2)
4.	GPB – 323	Principles of Genetics	3(2+2)
5.	LPM – 324	Livestock Production and Management	3(2+2)
6.	MBFT – 402	Microbiology	3(2+2)
7.	PPR – 326	Introductory Nematology	2(1+2)
8.	SWLE – 304	Fundamentals of Soil, Water & Conservation Engg.	3(2+2)
9.	SWLE – 305	Water Management Including Micro Irrigation	2(1+2)
10.	ENVS – 512	Agriculture Disaster Management (New)	2(2+0)
		TotalCredits	25(18 + 14)

Total Classes = 32

Semester III

Sr. No.	Course Code	Course Title	Credit hrs.
1.	AGRN – 411	Field Crops – I (<i>Kharif</i>)	4(3+2)
2.	HORT – 412	Production Technology of Vegetables & Flowers	3(2+2)
3.	BIOL – 413	Crop Physiology	3(2+2)
4.	AEAB– 414	Agricultural Finance and Cooperation (Course Code changed)	3(2+2)
5.	FMPE – 415	Farm Power Machinery and Renewable Energy	3(2+2)
6.	GPB – 416	Principles of Plant Breeding	3(2+2)
7.	SES – 417	Manures, Fertilizer & Soil Nutrient Management	3(2+2)
8.	SES – 418	Environmental Science & Water Science	3(2+2)
9.	ENVS – 419	Agricultural Meteorology (New)	3(2+2)
10.	EXT – 419	Entrepreneurship Development & Communication Skills (New)	3(2+2)
TotalCredits			31(21 + 20)

Total Classes = 41

Semester IV

Sr. No.	Course Code	Course Title	Credit hrs.
1.	APFE – 421	Post Harvest Technology	3(2+2)
2.	BCBT – 422	Biochemistry	3(2+2)
3.	AEAB – 423	Agricultural Marketing, Trade and Price (Course Code changed)	2(1+2)
4.	GPB – 424	Principles of Seed Technology	3(2+2)
5.	HORT – 425	Production Technology of Fruit Crop	3(2+2)
6.	HORT – 426	Production Technology of Spices, Aromatics, Medicinal and Plantation Crops	3(2+2)
7.	PPR – 427	Diseases of Field Crops and Their Management	3(2+2)
8.	PPR – 428	Insect Ecology & Integrated Pest Management	3(2+2)
9.	AGRN – 429	Field Crops II (<i>Rabi</i>)	4(3+2)
10.	SES - 430	Geochemistry (New)	2(1+2)
TotalCredits			29(19+20)

Total Classes = 39

Semester V

Sr. No.	Course Code	Course Title	Credit hrs.
1.	AHM– 510	Animal Health Management	2(2+0)
2.	AGRN – 511	Farming System and Sustainable Agriculture	2(1+2)
3.	DT – 513	Dairy Technology	3(2+2)
4.	AEAB – 514	Fundamentals of Agri Business Management (Including Product Development, Appraisal and Monitoring) (Course Code changed)	2(1+2)
5.	EXT – 515	Fundamentals of Rural Sociology and Education	2(2+0)
6.	GPB – 516	Breeding of Field & Horticultural Crops	3(2+2)
7.	HORT – 517	Post Harvest Management and Value Addition of Fruits and Vegetables	3(2+2)
8.	PPR – 518	Crop Pests and Stored Grain Pests and Their Management	3(2+2)
9.	PPR – 519	Disease of Horticultural Crops and Their Management	3(2+2)
10.	MAS – 540	Agriculture Statistics	3(2+2)
TotalCredits			26(18+16)

Total Classes = 34

Semester VI

Sr. No.	Course Code	Course Title	Credit hrs.
1.	AGRN – 521	Rainfed Agriculture	3(2+2)
2.	AGRN – 522	Organic Farming	3(2+2)
3.	AGRN – 523	Weed Management	3(2+2)
4.	AEAB – 524	Entrepreneurship Development (New Course Code)	3(2+2)
5.	AEAB – 525	Production Economics & Farm Management (New Course Code)	3(2+2)
6.	EXT – 526	Extension Methodologies for Transfer of Agricultural Technology	2(1+2)
7.	GPB – 527	Principles of Plant Biotechnology	3(2+2)
8.	LNG – 528	Comprehension and Communication Skills in English	1(1+0)
9.	SWLE – 607	Remote Sensing & GIS	2(1+2)
10.	APM – 530	Small Animal Production Management	3(2+2)
TotalCredits			26(17+18)

Total Classes = 35

Semester VII & VIII

RAEDP 620	Experiential Learning	20 credits	-	24 weeks
RAEDP 621	Village visit / Research Station	10 credits	-	10 weeks
RAEDP 622	In-plant training / Entrepreneurship Development	<u>10 credits</u>	-	<u>10 weeks</u>
	Total	40 credits		44 weeks

Village visit and Experiential Learning will run concurrently in the 7th Semester. For inplant / Entrepreneurship training the students will be sent to different stakeholders / research centers in the 8th Semester. The students will be evaluated for each module separately as per the credit allotted for each module.

1stSemester

CHEM – 300

General Chemistry (Org., Inorganic and physical)

3(2+2)

Physical Chemistry

- Unit- 1. Concepts of Ionization, Acids, Bases and Salts; pH and buffers.
- Unit-2. Osmosis and Osmotic Pressure, Laws of Osmotic Pressure
- Unit-3. Catalysis – Theory of Catalysis, Biological Catalysis-Enzymes.
- Unit-4. Colloids and their applications. Inorganic and Organic Colloids.
- Unit-5. Biological significance of plant nutrients-Macro, Micro and Trace Elements, their role and availability.

Organic Chemistry –

- Unit-6. Classification and Properties of naturally occurring Carbohydrates, Lipids and Proteins.
- Unit-7. Structure, properties and role of Nitrogenous bases, Nucleosides, Nucleotides, RNA, DNA.
- Unit-8. Natural Products: Introduction of natural products – Alkaloids, Terpenes.
- Unit-9. Classification and properties of plant pigments.

Objectives:

- To mould the students with a good moral character.
- To create awareness of the responsibility towards other creations.
- To impart values of humanity and solidarity in the local, national and international levels.

1. Background of Value Education

- What is Value Education
- Importance of Value Education
- Definition of Values, Morals and Ethics
- The Aims and Objectives of Value Education
- Culture and Values and Values Crisis
- Some Areas of Concern in Value Education – Education for peace, respect for life, justice, issues of women, job-oriented education, faith in God, democracy, self-respect, ecology, the meaning of success, noble truths in all religions.

2. My Country, My People.

- Truly Indian, Really Modern, Deeply Human
- Nationalism and Internationalism
- The Fundamental Rights and Duties of a Citizen

3. Inter Personal Relationship.

- Areas of interpersonal relationship (the home, among friends etc.)
- Issues hindering Inter-personal relationship
- Towards improving inter-personal relationship

4. Personality Development

- Definition of Personality
- Elements and Stages of Personality Development

5. Motivations and Will Power

- Motivation for Study
- Motivation and setting Goals
- Decision Making

6. Choice of Vocation / Career Guidance

- Sociologists and Psychologists' Contribution
- Implication for counseling
- Youth and Career (Objectives, Components and Career Planning)
- Career Development Activities

7. Some Issues and Concerns in Moral Education

- Morality and Religion (Traditional morality and religious faith, Views and debates on morality and religion), Spiritual Nature of Man, Marriage, Love and Sexuality, Aids, Abortion, War and Terrorism, Corruption as Omnibus, Drug Addiction and Alcoholism, Tobacco and its Evils, Women Issues (Gender Inequalities), Ecological Crises, Human Right Issues, Media and its Impact, Value of work and Value of Time. Indian Education System, Human Communication.

Recommended Reading:

Jacob, Mani, ed. Resource Book of Value Education (New Delhi, Institute of Value Education, 2002)

PSY 302 Human development, professional ethics and personality development1(1+0)

1. Introduction to Human Development, Principles of Human Development, Stages of Human Development, Developmental tasks for each stage of development, Impact of maturation and bearing on development, Heredity and Environment.
2. Personality: Derivation of the term "Personality" – tracing the historical background of the definition of personality. Definition – mainly Allport's definition, stressing uniqueness, enduring characteristics, individuality and interaction with the environment.
3. Personality approaches: Psychodynamic (Freud, Jung & Adler), Humanistic Approach to Personality: Concept of Guans (Rogers & Maslow), Dispositional approaches – Type (Jung. Type A & B, Rotter and The Big Five Model) and Trait Approaches (Cattell) Behavioral Approaches – Locus of control and Social learning Theory.
4. Theories of personality: (Psychoanalytic approach, trait approach, learning approach, social-cognitive approach, humanistic approach).
5. Assessment of personality: Questionnaires, Interviews, Projective techniques (TAT, Rorschach's Ink Blot Test, Sentence Completion Test), Behavioural Assessment, Observation, Self-Report Measures and Case Study Method.
6. Application: Increasing self efficacy through goal setting, Personality development through training, Personality profiles of successful persons of the particular area with the help of case study method.

Reading List (For Professional Ethics)

- Scientific values and professional ethics in agricultural research – Jagannadham Challa, Principal Scientist, HRD, NAARM, Rajendranagar, Hyderabad – 500 030
- Ethical issues in agricultural research, technology and intellectual property rights – Anil K. Gupta, K. L Chair Professor of Entrepreneurship, Indian Institute of Management, Ahmadabad 380 015, anilg@iimahd.ernet.in www,iimahd.ernet.in~anilg also see www.sristi.org and www.nifindia.org.

Books for Reading:

1. Feldman, R. S. (8th ed.) (2008). *Understanding psychology*. TMH
2. Zimbardo, P. G. and Weber, A. L. (1997). *Psychology*. N. Y. : Pearson
3. Baron, R. A. (2001). *Psychology*. New Delhi: Pearson Education Pvt. Ltd.
4. Morgan, King, Weiss and Schopler *Introduction to Psychology*, VII edition, (1989) McGraw Hill, India.

Theory of quadratic, Binomial-Theorem (for +ve index), Use of natural & common logarithms, exponential series, partial-fractions, Determinants of order 3, Theory of Matrices, addition, subtraction, multiplication, transpose, elementary ideas on ad joint & inverse. Solution of linear equations, inequalities, permutation & combination.

Trigonometry

Trigonometrical – functions, addition & subtraction formula, double & half angle formula laws of sines& cosines, solutions of triangles, height & distance, real & complex-numbers, hyperbolic trigonometric functions. De-Moivre’s Theorem.

Coordinate-Geometry: Distance between two points, Area of triangle, Straight-lines.

Reference – Books:

- Algebra: Hall & Knight
- Trigonometry: S. L. Loney
- Coordinate-Geometry: S. L. Loney

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Introduction to computers : History, evolution, Memory & Input / Output / Storage Devices.

Software: Type of software, System software, Applications Software, Introduction to Ms-Word and Ms-Excel.

Operating Systems: Definition, functions of Operating System. Booting process of computer-warm and cold. Introduction to DOS and Windows Operating System.

Computer Viruses: Types of computer viruses, worms, Trojans, Security Aspects.

Reference Books: Raja Raman V. (2004), “Introduction to Information Technology”. PHL
Jain, V. K.; “Information Technology”, S. K. Kataria
V. K. Jain & Pankaj Bhambri, “Fundamentals of Information Technology”, S. K. Kataria
P. K. Sinha and P. Sinha, “Foundation of Computing”, BPB

Practical List:

- * DOS – Internal / External Commands
 FORMAT
 DIR
 COPY
 PATH
 LABEL
 VOL
 MD, CD
 DEL TREE

- * Windows – WINDOWS GUI, Desktop and its elements, Windows Explorer
 Working with files and folders, setting time and date, Title Bar, Scroll Bars,
 Menu and Tool Bars

- * MS-Word – Text, graphics, Text boxes, viewing the documents, character and paragraph
 formatting, page setup, header, footer.

**AGRN 312 Introductory Agriculture (Ancient Heritage, Agricultural Scenario
and Gender Equity in Agriculture)**

1(1+0)

- History of Agricultural development in India.
- Factors affecting crop production
- Soil factors
- Social and economic factors
- Diversity in physiographic
- Soil groups
- Dry and irrigated agriculture
- Farming systems approach
- Value addition
- Requirements in new technology and research
- Role of women in Agriculture.

HORT 313

Fundamental of Horticulture

3 (2+2)

Theory

- Importance and scope of Horticulture in India with special reference to U.P.
- Classification of fruits based on soil and climate
- Layout of an orchard
- Propagation techniques of fruit plants
- Principles and methods of pruning and training
- Irrigation of fruit trees
- Macro and Micro-nutrients use in orcharding

Practical

- Different techniques of propagation
- Use of planting board
- Pruning and training tools and implements
- Spraying of nutrients to overcoming deficiencies in the fruit plants.

- Soil Composition: Soil Air and Soil solution- effect of gas phase on soil solution.
- Soil water- Energy relation, law of mass action and equilibrium constant, solubility product.
- Salinity and alkalinity hazard, classification of irrigation water quality of irrigation water, SAR and its relation to ESP.
- Dissociation of water-strong and Weak electrolytes.
- Soil colloids-organic and inorganic, colloidal Chemistry of inorganic soil constituents, lattice-unit cell, structure of silicate clays.
- Surface chemistry of soil clays, Adsorption.
- Cations and anion exchange reactions, bases saturation-importance in soil, phosphate fixation and retention.
- Acid base chemistry
- Chemistry of soil organic matter – complex formation and chelation
- Components of soil, soil-separates-their properties
- Relationship between different soil constituents-particle density, bulk density, void ratio
- Gravimetric and volumetric water constant.
- Soil separates-influence on properties and behavior of soils, Mechanical analysis.
- Soil texture, Soil structure
- Soil crusts-formation-properties and effect.

Practical

- Principles of analytical instruments-colorimetric and flame photometry
- Preparation of standard solution, normal, molar, molal and ppm solution.
- Estimation of pH, EC organic carbon.
- Estimation of cations and anions in soil extracts, residual Na_2CO_3
- Appraisal of water quality, CaCO_3 equivalent
- Mechanical soil analysis-Principles and methods
- Particle density, Bulk density and pore space of soil
- Available water content, Field capacity.

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2nd Semester

MAS 304

Elementary Mathematics II

2(2+0)

Real numbers, coordinate line & planes, straight lines, function.

Limits, properties, derivatives, differentiation of sine & cosine, continuity, properties of continuous functions, differentiation of algebraic, trigonometric, logarithmic & exponential functions, product of functions, function of a function.

Derivative as a rate change, maxima & minima of a single variable.

Integral of a real function, integration by substitution, integral of trigonometric & Transcendental function.

Vector in a plane, vector function, sum & difference of vectors of vectors, dot & cross-product.

Reference- Books

Differential –Calculus: Gorakh-Prasad

Integral- Calculus : Gorakh-Prasad

Education – Meaning, Definition, Types – Formal, Informal and Non-formal education and their Characteristics. Extension Education and Agricultural Extension – Meaning, Definition, Concepts, Objectives and Principles. Rural development – Meaning, Definition, Concepts, Objectives, Importance and Problems in rural development. Developmental programmes of pre-independence era – Sriniketan, Marthandam, Gurgaon experiment and Gandhian constructive programme. Developmental programmes of Post independence era, Firka Development, Etawah – Pilot project and Nilokheri Experiment. Community Development Programme – Meaning, Definition, Concepts, Philosophy, Principles, Objectives, Differences between Community Development and Extension Education, National Extension service.

Panchayat Raj system – Meaning of Democratic – Decentralization and Panchayat Raj, Three tiers of Panchayat Raj system, Powers, Functions and Organizational setup. Agricultural Development Programmes with reference to year of start, objectives & salient features – Intensive Agricultural District Programme (IADP), High Yielding Varieties Programme (HYVP), Institution Village Linkage Programme (IVLP), Watershed Development Programme (WDP), National Agricultural Technology Project (NATP), ATMA, ATIC. Social Justice and Poverty alleviation programmes – Integrated Tribal Development Agency (ITDA), Integrated Rural Development Programme (IRDP), Swarna Jayanti Gram Swaraj Yojana (SGSY), Prime Minister Employment Yojana (CMEY). New trends in extension, privatization. Women Development programmes – Development of Women and Children in Rural Areas (DWCRA), Rashtriya Mahila Kosh (RMK), Integrated Child Development Scheme (ICDS) and Mahila Samridhi Yojana (MSY). Reorganized extension system (T&V System) – Salient features, Fort night Meetings, Monthly workshops, Linkages, Merits and Demerits, Emergence of Broad Based Extension (BBE).

Practical: Visits to a village and kisan mandal to study the ongoing development programmes. Visits to Panchayat Raj Institutions to study the functioning of Gram Panchayat (GP) & Zilla Praja Parishad (ZPP). Visit and study the District Rural Development Agency (DRDA). Participation in monthly workshops of Training and Visit (T & V) System. Visit to Watershed Development Project area. Visit to a village to study the Self Help Groups (SHGs) of DWCRA. Visit to a voluntary organization to study the developmental activities.

Organizing PRA techniques in a village to identify the agricultural problems. Visit to villages.

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Mendel's laws of inheritance and exceptions to the laws; Types of gene action, Multiple alleles, Pleiotropism, Penetrance and expressivity; Quantitative traits, Qualitative traits and differences between them; Multiple factor hypothesis; Cytoplasmic inheritance, its characteristic features and difference between chromosomal and cytoplasmic inheritance; Mutation and its characteristic features; Methods of inducing mutations and C I B technique.

Gene expression and differential gene activation; Lac operon and Fine structure of Gene; Ultra structure of cell and cell organelles and their functions; Study of chromosome structure, morphology, number and types, Karyotype and Idiogram; Mitosis and meiosis, their significance and differences between them; DNA and its structure, function, types, modes of replication and repair. RNA and its structure, function and types; Transcription, Translation, Genetic code and outline of protein synthesis; Crossing over and factors affecting it; Mechanism of crossing over and Cytological proof of crossing over; Linkage, Types of linkage and estimation of linkage; Numerical chromosomal aberrations (Polyploidy) and evolution of different crop species like Cotton, Wheat, Tobacco, Triticale and Brassicas; Structural chromosomal aberrations.

Practical: Microscopy (Light microscopes and electron microscopes; Preparation and use of fixatives and stains for light microscopy; Preparation of micro slides and identification of various stages of mitosis; Preparation of micro slides and identification of various stages of mitosis; Preparation of micro slides and identification of various stages of meiosis; Preparation of micro slides and identification of various stages of meiosis; Monohybrid ratio and its modifications; Dihybrid ratio and its modifications; Trihybrid ratio; Chi-square analysis and Interaction of factors; Epistatic factors, Supplementary factors and Duplicate factors; Complementary factors, Additive factors and Inhibitory factors; Linkage – Two point test cross; Linkage – Three point test cross; Induction of polyploidy using colchicines; Induction of chromosomal aberrations using chemicals.

Place of livestock in the national economy, different livestock development programmes of Govt. of India. Important exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Measures and factors affecting fertility in livestock, reproductive behaviour like oestrus, parturition, farrowing etc. Milk secretion, milking of animals and factors affecting milk yield and composition. Selection and breeding of livestock for higher milk and meat production. Feeding and management of calves, growing heifers and milch animals and other classes and types of animals, housing principles, space requirements for different species of livestock.

Disease control measures, sanitation and care, breeding, feeding and production records. Breed characteristics of poultry, their methods of rearing, breeding, feeding and management, incubation, hatching and brooding, vaccination and prevention of diseases, preservation and marketing of eggs, its economics and keeping quality. Cost of production of milk, economical units of cattle, buffalo, sheep, goat and swine.

Practical: Identification, handling and restraining of animals; Judging and culling; Feeding and ration formulation; Hatching, housing and management of poultry; Visit to livestock farms and Economics of livestock production.

- History, development & scope of Microbiology
- Bacteria-morphology, reproduction, growth, nutrition & metabolism
- Yeast, mold & virus-morphology & characteristics
- Bacterial Genetics
- Introduction to medical, industrial, environmental, food & dairy microbiology
- Soil Microbiology: Soil microflora, Plant-Microbe interactions, microbial transformations of carbon, nitrogen, phosphorus and sulphur, biological nitrogen fixation. Microflora of Rhizosphere and Phyllosphere, microbes in composting.
- Beneficial microorganisms in agriculture: Biocontrol agents, biofertilizer, biopesticide
- Biodegradation, biogas production

Practical:

- Familiarity with apparatus and equipment
- Preparation of common culture media
- Pure culture techniques for Isolation and enumeration of Bacteria
 - * Isolation and enumeration by Pour Plate Method
 - * Isolation and enumeration by Spread Plate Method
 - * Isolation of Bacteria by Streak Plate Method
- Staining-simple, gram, spore
- Biochemical tests for bacterial identification

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Introduction: History of phytonematology. Economic importance. General characteristics of plant pathogenic nematodes. Nematode general morphology and biology. Classification of nematodes upto family level with emphasis on groups containing economically important genera. Classification of nematodes by habitat. Identification of economically important plant nematodes upto generic level with the help of keys and description. Symptoms caused by nematodes with examples. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses. Different methods of nematode management. Cultural methods (crop rotation, fallowing, soil amendments, other land management techniques), physical methods (soil solarisation, hot water treatment) Biological methods, Chemical methods (fumigants, non fumigants). Resistant varieties. IDM.

Practical: Methods of survey – sampling methods, collection of soil and plant samples; Extraction of nematodes from soil and plant tissues following combined Cobb's decanting – sieving and Baermann funnel technique, counting and estimation of plant parasitic nematodes; Preparation of temporary and permanent mounts; Method of preparation of perineal patterns for identification of species of Meloidogyne; Study and identification of most important plant parasitic nematodes with special reference to their characteristics and symptomatology – Meloidogyne, Pratylenchus; Heterodera, Ditylenchus, Globodera, Tylenchulus, Xiphinema, Radopholus, Rotylenchulus, and Helicotylenchus. Experimental techniques used in pathogenicity studies with root knot nematode.

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Course: Agricultural Disaster Management

Course Code: ENVS – 512

Credits: 2(2+0)

1. **Basic concepts of disaster:** Definition, Introduction to natural and manmade disasters. History of natural disasters in India, Concept of risk, hazard, and vulnerability.
2. **Natural Disaster:**
 - a) **Floods and Flash floods:** general characteristics, causes, nature and frequency of flooding floodplains, flood hydrographs, river and coastal floods.
 - b) **Droughts;** causes, classification - agricultural, hydrological and meteorological droughts; drought frequency and intensity.
 - c) **Cyclones and Tsunamis;** structure and nature of cyclones and tsunamis, characteristics factors, hazard potential
 - d) **Landslides,** causes, susceptibility to landslides and slope failures.
3. **Disaster Impact Assessment:** severity, extent of damage on agricultural production systems, economic losses affecting livelihood, social and economic perspective.
 - a) **Crop loss;** quantity, quality, social and economic perspective.
 - b) **Livestock/Fish/Poultry:** mortality, morbidity, health, reproduction, yield, feed and fodder availability.
 - c) **Irrigation Infrastructure:** siltation, damage to canal network, tube wells, open wells, dug wells, channels, ponds etc.
 - d) **Soil and Water:** Impact on soil erosion, water availability, accessibility and quality.
4. **Planning and Preparedness for Disaster Management:** strategies for disaster management planning, role of IT, remote sensing, GIS and GPS in disaster preparedness,
5. **Frameworks, Approaches and Methods for Disaster Risk Reduction:** understanding resilience, disaster response and post disaster recovery, nature and type of immediate response, disaster management plans,
6. **Contingency Planning for Disaster Risk Reduction:** agronomic, engineering other non-engineering interventions for drought, flood, agro-met advisories, crop advisories, community nursery, contingent seed bank, mini-kit availability, strategies for fisheries management in flood prone areas, livestock shelters, feed and fodder banks, mass vaccination of livestock, etc.

7. **Policies for Disaster Management:** Disaster Management act and Policies in India, Insurance and loan schemes: criteria and constraints of crop/animals insurance and credit guarantee schemes.
8. **Case studies and field visits.**

Semester III

AGRN – 411

Field Crops-I (*Kharif*)

4(3+2)

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of kharif crops, Cereals – rice, maize, sorghum, pearl millet and minor millets; Pulses : pigeonpea, mungbean and urdbean; Oilseeds: groundnut, sesame and soybean; Fibre crops: cotton, jute and sunhemp; and Forage crops: sorghum, maize, cowpea, cluster bean and napier.

Practical: Rice nursery preparation and transplanting/seed bed preparation and sowing of Kharif crops; Calculations on seed rate; Sowing of soybean, pigeonpea, mungbean, maize, groundnut, and cotton; Effect of seed size on germination and seedling vigour of soybean/groundnut; Effect of sowing depth on germination of soybean; Identification of weeds in rice, maize and soybean fields and study of weed control experiments in these crops; Top dressing of nitrogen in maize and rice and study of fertilizer experiments on rice, maize, sorghum and millets; Study of yield contributing characters, yield calculations, harvesting and yield estimation of above crops; Study of crop varieties and important agronomic experiments; Study of forage experiments.

HORT – 412

Production Technology of Vegetables and Flowers

3(2+2)

Importance of Olericulture, vegetable gardens, vegetable classification. Origin, area, production, varieties, package of practices for fruit vegetables –, tomato, brinjal, chillies, and okera; Cucurbitaceous vegetables cucumber, ridge gourd, ash gourd, snake gourd, bottle gourd, bitter gourd and melons, Cole crops – cabbage, cauliflower and knol-khol. Bulb crops – onion and garlic. Beans and peas – French beans, cluster beans, dolichos beans, peas and cowpea. Tuber crops – potato, sweet potato, tapioca, colocasia, yams; Root crops – carrot, radish, turnip and beet root; Leafy vegetables – amaranthus, palak, gogu; Perennial vegetables – drumstick, coccinia and curry leaf. Importance of ornamental gardens.Planning of ornamental gardens.Types and styles of ornamental gardens.Use of trees, shrubs, climbers, palms, houseplants and seasonal flowers in the gardens.Package of practices for rose, jasmine, chrysanthemum, crossandra, marigold and tuberose.

Practical: 1 Planning and layout of kitchen garden; 2 Identification of important vegetable seeds and plants; Raising of vegetable nurseries; Identification of ornamental plants (trees ,shrubs,climbers,house plants,palms etc.,) and development of garden features; Transplanting of vegetable seedlings in main field; Layout of lawns and maintenance; Seed extraction in tomato and brinjal; Depotting, repotting and maintenance of house plants; Visit to commercial vegetable farms; Training and pruning of rose (standards, hybrid ‘T’ roses cented roses) and chrysanthemum (pinching and disbudding); Planning and layout of gardens and garden designs for public and private areas; Intercultural operations in vegetable plots; Seed production in vegetable crops; Harvesting indices of different vegetable crops; Grading and packing of vegetables; Prolonging the shelf life of cut flowers

Introduction, Importance in Agriculture. Seed Physiology, Seed structures, Morphological, physiological and biochemical changes during seed development, Physiological maturity – Morphological and physiological changes associated with physiological maturity in crop, Harvestable maturity, Seed viability and vigour, Factors affecting seed viability and vigour.

Methods of testing seed viability and vigour, Germination, Utilization of seed reserves during seed germination, Morphological, physiological and biochemical changes during seed germination, Factors affecting seed germination. Growth and Development, Definition, Determinate and Indeterminate growth, Monocarpic and Polycarpic species with examples. Measurement of growth, Growth analysis Growth characteristics, Definitions and mathematical formulae. Crop Water Relations, Physiological importance of water to plants, Water potential and its components, measurement of water status in plants. Transpiration, significance, Transpiration in relation to crop productivity, Water Use Efficiency, WUE in C₃, C₄ and CAM plants, Factors affecting WUE. Photosynthesis, Energy synthesis, Significance of C₃, C₄ and CAM pathway, Relationship of Photosynthesis and crop productivity, Translocation of assimilates, Phloem loading, apoplastic and symplastic transport of assimilates, Source and sink concept, Photorespiration, Factors affecting Photosynthesis and productivity, Methods of measuring photosynthesis, Photosynthetic efficiency, Dry matter partitioning, Harvest index of crops. Respiration and its significance, Brief account of Growth respiration and maintenance respiration, Alternate respiration – Salt respiration – wound respiration – measurement of respiration. Nutriophysiology – Definition – Mengel's classification of plant nutrients – Physiology of nutrient uptake – Functions of plant nutrients – Deficiency and toxicity symptoms of plant nutrients – Foliar nutrition – Hydroponics. Introduction of Photoperiodism and Vernalisation in relation to crop productivity – Photoperiodism Plant Growth Regulators – Occurrence – Biosynthesis – Mode of action of Auxins, Gibberellins, Cytokinins, ABA, Ethylene. Novel plant growth regulators, Commercial application of plant growth regulators in agriculture. Senescence and abscission – Definition – Classification – Theories of mechanism and control of senescence – Physiological and biochemical changes and their significance. Post Harvest Physiology – Seed dormancy – Definition – types of seed dormancy – Advantages and disadvantages of seed dormancy – Causes and remedial measures for breaking seed dormancy, Optimum conditions of seed storage – Factors influencing seed storage (ISTA standards). Fruit ripening – Metamorphic changes – Climateric and non-climateric fruits – Hormonal regulation of fruit ripening (with ethrel, CCC, Polaris, paclobuterozole).

Practical: Preparation of solutions; Growth analysis: Calculation of growth parameters; Methods of measuring water status in roots, stems and leaves; Measurement of water potential by Chardakov's method; Measurement of absorption spectrum of chloroplastic pigments and fluorescence;

Sources of farm power. Status and scope of farm mechanization in India. I.C. Engines terminology, classification, components and function. Engine systems, Construction working of four stroke and two stroke cycle engines. Tractor development and their types. Selection of tractors and cost of tractor power. Tillage: Primary and secondary tillage implements. Seeding machines. Implements for intercultural operation. Paddy transplanters. Plant protecting equipment and harvesting equipments. Solar energy option, solar radiation, solar energy operated systems for heating, cooling, drying and water pumping, solar pond. Thermal energy storage, photovoltaic conversion. Available wind power. Types of wind mills and their characteristics. Anaerobic fermentation of biomass. Biogas system for heating, lighting and running IC engines. Geothermal energy.

Practical: Study different components of I.C. Engine and their constructional details, Study of Four strokes cycle engine, Study of Two-stroke cycle engine, Study of M.B. plough, measurement of plough size, different parts, horizontal and vertical suctions, determination of line of pull etc., Study of disc plough, Study of seed cum fertilizer drill, Furrow opener, metering mechanism and calibration, Study of Constructional and operational details of Harrows and Cultivators, Study of paddy transplanters, Study of Harvesting and Threshing machines, Visit of biogas plants in nearby villages, Study of Agricultural Tractors and their Care and maintenance.

Classification of plants, Botanical description, Floral biology, Emasculation and Pollination techniques in cereals, millets, pulses, oil seeds, fibers, plantation crops etc. Aims and objectives of Plant Breeding; Modes of reproduction, Sexual, Asexual, Apomixis and their classification; Significance in plant breeding; Modes of pollination, genetic consequences, differences between self and cross pollinated crops; Methods of breeding – introduction and acclimatization. Selection, Mass selection Johansson's pure line theory, genetic basis, pure line selection; Hybridization, Aims and objectives, types of hybridization; Methods of handling of segregating generations, pedigree method, bulk method, back cross method and various modified methods; Incompatibility and male sterility and their utilization in crop improvement; Heterosis, inbreeding depression, various theories of Heterosis, exploitation of hybrid vigour development of inbred lines, single cross and double cross hybrids; Population improvement programmes, recurrent selection, synthetics and composites; Methods of breeding for vegetatively propagated crops; Clonal selection; Mutation breeding; Ploidy breeding; Wide hybridization, significance in crop improvement.

Practical: Botanical description and floral biology; Study of megasporogenesis and microsporogenesis; Fertilization and life cycle of an angiospermic plant; Plant Breeder's kit; Hybridization techniques and precautions to be taken; Floral morphology, selfing, emasculation and crossing techniques; Study of male sterility and incompatibility in field plots; Rice and Sorghum; Maize and Wheat; Bajra and ragi; Sugarcane and coconut; Groundnut, Castor, Safflower and Sesamum; Redgram, Bengalgram and Greengram; Soybean and blackgram; Chillies, Brinjal and Tomato; Bhendi, Onion, Bottle gourd and Ridge gourd; Cotton and Mesta; Jute and Sunhemp

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Scope and importance of environmental studies. Natural resources: Renewable and renewable resources. Forest, Water, Food, energy and land resources. Ecosystems: Definition, concept, structure and functions. Producers, consumers and decomposers of an ecosystem. Energy flow in the ecosystem. Types of ecosystems. Bio-diversity: Definition, classification, threats to biodiversity and its conservation. Environmental pollution: Causes, effects and control of air, water, soil, thermal, noise and marine pollution. Causes, effects and management of soil nuclear hazards and industrial wastes. Disaster management, Floods, earthquakes, cyclones and land slides. Social issues and the environment, unsustainable to sustainable development. The Environment Protection Act, The Air Act, The water Act, The Wildlife Protection. Act and Forest Conservation Act. Woman and child welfare, HIV/AIDS and Role of information technology on environment and human health.

Practical: Collection, processing and storage of effluent samples; Determination of Bio- Chemical oxygen demand (BOD) in effluent sample; Determination of chemical oxygen demand (COD) in effluent sample; Estimation of dissolved oxygen in effluent samples; Determination of sound level by using sound level meter; Estimation of respirable and non respirable dust in the air by using portable dust sampler; Determination of total dissolved solids (TDS) in effluent samples; Estimation of species abundance of plants; Estimation of nitrate contamination in ground water; Analysis of temporary and total hardness of water sample by titration; Estimation of pesticide contamination in Agro-Ecosystem; Visit to Social Service Organisation / Environmental Education Centre; Crop adaptation to environmental variables, soils conditions; Study of transpiration and water balance in plants; Visit to a local polluted site. Observations and remedial measures; Assessment of chlorophyll content of fresh water / sea water ecosystem.

Meaning and scope of agricultural meteorology; Weather and climate, climatic controls, micro-climate, weather elements. Earth's atmosphere: composition and structure; Solar radiation, solar constant, radiation budget and laws of radiation; Atmospheric temperature, factors affecting horizontal and vertical temperature distribution, Global warming; Atmospheric pressure: distribution and pressure belts, Isobars; Wind: general circulation, planetary and local winds, cyclones, anticyclones, trough and ridge; Atmospheric humidity, vapour pressure; Evaporation, transpiration and evapotranspiration; Condensation: process and types; Forms of precipitation: rain, drizzle, snow, rime, sleet, glaze and hail; Formation and classification of clouds and cloud seeding; Introduction to Indian monsoon; weather forecasting, its application to agriculture and agro advisory services.

Practical: Site selection for Agromet observatory; Layout plan of Agromet observatory (Agromet field unit); Measurement of soil temperature; Measurement of grass minimum temperature, Measurement of rainfall; Measurement of evaporation; Measurement of atmospheric pressure; Measurement of sunshine duration; Measurement of wind direction; Measurement of wind speed; Measurement of cloud amount; Measurement of air temperature; Measurement of relative humidity and measurement of dew.

Theory

Content

Lecture

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|---|---|
| • Meaning and scope of agricultural meteorology. | 1 |
| • Weather and climate, climatic controls, micro-climate, weather elements. | 3 |
| • Earth's atmosphere: Composition and structure. | 2 |
| • Solar radiation, solar constant, radiation budget and laws of radiation | 3 |
| • Atmospheric temperature, factors affecting horizontal and vertical temperature distribution. | 3 |
| • Global warming. | 2 |
| • Atmospheric pressure: distribution and pressure belts, Isobars. | 2 |
| • Wind: general circulation. planetary and local winds, cyclones, anticyclones, trough and ridge. | 3 |
| • Atmospheric humidity, vapour pressure. | 3 |
| • Evaporation, transpiration and evapotranspiration. | 2 |
| • Condensation: process and types. | 2 |
| • Forms of precipitation: rain, drizzle, snow, rime, sleet, glaze and hail. | 2 |
| • Formation and classification of clouds and cloud seeding. | 2 |
| • Introduction to Indian monsoon. | 2 |
| • Weather forecasting , its application to agriculture and agro advisory services | 2 |

Course Title: **Entrepreneurship Development and Communication Skills**

Course Code: **EXT 419**

Credit: **3(2+2)**

Theory: Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic system and their implications for decision making by individual entrepreneurs. Globalization and the emerging business/entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise: motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises (SMEs)/ SSI. Export and Import Policies relevant to agriculture sector. Venture capital. Contact farming and joint ventures, public-private partnerships. Overview of agri inputs industry. Characteristics of Indian agricultural processing and export industry. Social Responsibility of Business. Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing abstracting; individual and group presentations, impromptu presentation, public speaking; group discussion. Organizing seminars and conferences.

Practical: Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing footnote and bibliography procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentation.

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Green house technology, Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of greenhouse for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, Typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis. Choice of crops for cultivation under greenhouses, problems / constraints of greenhouse cultivation and future strategies. Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics. Threshing, threshers for different crops. Parts, terminology, care and maintenance. Winnowing, manual and power operated winnowers, care and maintenance. Groundnut decorticators, hand operated and power operated decorticators, principles of working, care and maintenance. Maize shellers & castor shellers. Drying, grain drying, types of drying, types of dryers, storage, grain storage, types of storage structures. Fruits and vegetables cleaning, machinery for cleaning of fruits and vegetables, care and maintenance. Grading, methods of grading, equipment for grading of fruits and vegetables, care and maintenance. Size reduction. Equipment for size reduction care and maintenance. Evaporation, Principle, types of evaporators, quality standards – FAQ, ASTA, FPO, FDA.

Practical: Study of different types of green houses based on shape, construction and cladding materials; Calculation of air rate exchange in an active summer winter cooling system; Calculation of rate of air exchange in an active winter cooling system; Estimation of drying rate of agricultural products inside green house; Testing of soil and water to study its suitability for growing crops in greenhouses; The study of fustigation requirements for greenhouses crops and estimation of E.C. in the fustigation solution; The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization; Visit to commercial green houses; Study of threshers, their components, operation and adjustments; Winnowers, their components, operation and adjustments; Study of different components of groundnut decorticator; Study of maize shellers; Study of castor shellers; Study of improved grain storage structure; study of dryers; study of cleaners & graders.

Biochemistry – Introduction and importance. Plant cell, cell wall and its role in live stock, food and paper industries. Bio-molecules – Structure, properties & applications: Amino acids, peptides and proteins – Plant proteins and their quality. Enzymes – Factors affecting the activity, classification, Immobilisation and other industrial applications. Lipids – Acyl lipids, Their industrial application in soaps, detergents, paints, Varnishes, lubricants, adhesives, plastics, nylon, Bio-diesel, Biodegradable plastics etc. Carbohydrates; Nucleotides and Nucleic acids. Metabolic energy and its generation – Metabolism – Basic concepts, Glycolysis, Citric acid Cycle, Pentose phosphate pathway, oxidative phosphorylation, Fatty acid oxidation. General reactions of amino acid degradation. Biosynthesis – carbohydrates, Lipids, Proteins and Nucleic acids. Metabolic regulation. Secondary metabolites, Terpenoids, Alkaloids, Phenolics and their applications in food and pharmaceutical industries.

Practical: Amino acid models (atomic); Paper electrophoresis for the separation of plant pigments; Protein denaturation – heat, pH, precipitation of proteins with heavy metals, Protein estimation by Lowry method; Enzyme kinetics, competitive inhibition, enzyme immobilization; Extraction of nucleic acids, column chromatography of RNA hydrolysate; Characterization of lipids by T.L.C.; Extraction of oil from oil seeds; Estimation of fatty acids by G.L.C.; Models of sugars, sucrose & starch; Quantitative determination of sugars; Paper chromatography for the separation of sugars; Determination of phenols.

Agricultural Marketing: Concepts and Definition, Scope and subject matter, Market and Marketing: Meaning, Definitions, Components of a market, Classification. Market structure, Conduct, performance. Marketing structure, Market functionaries or agencies, Producer’s surplus: Meaning, Types of producers surplus, marketable surplus. Marketed surplus, importance, Factors affecting Marketable surplus. Marketing channels: Meaning, Definition, Channels for different products. Market integration, Meaning, Definition, Types of Market Integration. Marketing efficiency: Meaning, Definition, Marketing costs, Margins and price spread, Factors affecting the cost of marketing, Reasons for higher marketing costs of farm commodities, Ways of reducing marketing costs. Theories of International Trade: Domestic Trade, Free trade, International Trade, GATT, WTO, Implications of AOA. Market access, Domestic support, Export subsidies, EXIM-Policy & Ministerial conferences. Cooperative Marketing.State Trading.Ware Housing Corporation; Central and State, Objectives, Functions, Advantages. Food Corporation of India: Objectives and Functions. Quality Control, Agricultural Products, AGMARK. Price Characteristics of agricultural product process, Meaning, Need for Agricultural Price Policy. Risk in Marketing: Meaning and importance, Types of Risk in Marketing. Speculations and Hedging, Futures trading, Contract farming.

Practical: Identification of marketing channels; Study of Rythu Bazars, Regulated markets; Study of unregulated markets; Study of livestock markets; Price spread analysis; Visit to market institutions, NAFED; Study of SWC, CWC and STC; Analysis of information of daily prices; Marketed and marketable surplus of different commodities.

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Introduction to Seed Production, Importance of Seed Production, Seed policy, Seed demand forecasting and planning for certified, foundation and breeder seed production, Deterioration of crop varieties, Factors affecting deterioration and their control; Maintenance of genetic purity during seed production, Seed quality; Definition, Characters of good quality seed, Different classes of seed, Production of nucleus & breeder's seed, Maintenance and multiplication of pre-release and newly released varieties in self and cross-pollinated crops; Seed Production, Foundation and certified seed production in maize (varieties, hybrids, synthetics and composites); Foundation and certified seed production of rice (varieties & hybrids); Foundation and certified seed production of sorghum and bajra (varieties, hybrids, synthetics and composites); Foundation and certified seed production of cotton and sunflower (varieties and hybrids); Foundation and certified seed production of castor (varieties and hybrids); Foundation and certified seed production of tomato and brinjal (varieties and hybrids); Foundation and certified seed production of chillies and bhendi (varieties and hybrids); Foundation and certified seed production of onion, bottle gourd and ridge gourd (varieties and hybrids); Seed certification, phases of certification, procedure for seed certification, field inspection and field counts etc.; Seed Act and Seed Act enforcement, Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories; Duties and powers of seed inspectors, offences and penalties; Seed control order: Seed Control Order 1983, Seed Act 2000 and other issues related to seed quality regulation. Intellectual Property Rights, Patenting, WTO, Plant Breeders Rights, Varietal Identification through Grow-Out Test and Electrophoresis; Seed Drying: Forced air seed drying, principle, properties of air and their effect on seed drying, moisture equilibrium between seed and air, Heated air drying, building requirements, types of air distribution systems for seed drying, selection of crop dryers and systems of heated air drying, recommended temperature and depth of the seeds, management of seed drying, Planning and layout of seed processing plant; Establishment of seed processing plant. Seed processing: air screen machine and its working principle, different upgrading equipments and their use, Establishing a seed testing laboratory. Seed testing procedures for quality assessment, Seed treatment, Importance of seed treatment, types of seed treatment, equipment used for seed treatment (Slurry and Mist-O-matictreater), Seed packing and seed storage, stages of seed storage, factors affecting seed longevity during storage and conditions required for good storage, General principles of seed storage, constructional features for good seed warehouse, measures for pest and disease control, temperature control, Seed marketing, marketing structure, marketing organization, sales generation activities, promotional media, pricing policy; Factors affecting seed marketing.

Practical: Seed sampling principles and procedures; Physical Purity analysis of Field and Horticultural crops; Germination analysis of Field and Horticultural crops; Moisture tests of Field and Horticultural crops; Viability test of Field and Horticultural crops; Seed health test of Field and Horticultural crops; Vigour tests of Field and Horticultural crops; Seed dormancy and breaking methods; Grow out tests and electrophoresis for varietal identification; Visit to Seed production plots of Maize, Sunflower, Bajra, Rice, Sorghum, Cotton, Chillies and Vegetables. (Add or delete crops of the region); Visit to Seed processing plants; Visit to Seed testing laboratories; Visit to Grow out testing farms; Visit to Hybrid Seed Production farms; Varietal identification in seed production plots; Planting ratios, isolation distance, roguingetc

Definition and importance of horticulture. Divisions of horticulture. Climatic zones of horticulture crops. Area and production of different fruit crops. Selection of site, fencing, and wind break, planting systems, high density planting, planning and establishment. Propagation methods and use of rootstocks. Methods of training and pruning. Use of growth regulators in fruit production. Package of practices for the cultivation of major fruits – mango, banana, citrus, grape, guava, sapota, apple, litchi. Papaya, Minor fruits – pineapple, annonaceous fruits, pomegranate, ber, fig, phalsa, jack, pear, plum, peaches and cherry.

Practical: Study of horticultural tools and implements and their uses; Containers, potting mixture, potting, depotting and repotting; Plant propagation, seed propagation, scarification, and stratification; Propagation by cuttings (soft wood, hard wood and semi-hardwood) layering (simple layering, Air layering, stouping in guava); Layout and planting systems (Traditional system and high density planting methods); Methods of pruning and training; Training of ber, grape and pomegranate; Pruning of ber, grape, phalsa, fig, apple, pear, peach; Description and identification of varieties of mango, guava, grape, papaya, apple and sapota; Description and identification of varieties of banana, citrus, (lime lemon, sweet orange, mandarin, grape fruit) pomegranate, ber, pear and cherries; Irrigation methods in fruit crops including drip – Micro irrigation methods of establishment of orchard; Methods of Fertiliser application methods in fruit crops including fertigation technology; Visit to local commercial orchards; Preparation of growth regulators, powder, solution and lanolin paste for propagation; Application of growth regulators for improving fruit set, fruit size, quality, delaying ripening and hastening ripening.

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Importance and cultivation technology of Spices – ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek; Aromatic crops – lemon grass, citronella, palmarose, vetiver, geranium, dawana; Plantation crops – coconut, arecanut, betelvine, cashew, cocoa, coffee, oil palm; Medicinal plants – diascoria, rauwolfia, opium, ocimum, perwinkle, aloe, guggul, belladonna, nuxvomica, Solanum khasiamum, aonla, senna, plantago, stevia, coleus and Acorus.

Practical: Botanical description and identification of aromatic plants; Identification of varieties in spices and plantation crops; Identification of medicinal plants; Propagation techniques in aromatic and spice crops; Selection of mother palm, and seed nuts in coconut and oil palm; Study of identification of aromatic plants; Distillation procedures for aromatic crops; Propagation methods in plantation crops; Propagation and planting methods in turmeric; Propagation and planting techniques in ginger; Harvesting procedures in aromatic plants; Processing and curing of spices (ginger, turmeric and black pepper); Training methods in betelvine; Rejuvenation practices in cashewnut; Products – byproducts of spices and plantation crops; Procedures for oleoresin extraction; Visit to local commercial plantations. Aromatic & medicinal plant nurseries and seed spices field.

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Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of rice, sorghum, bajra, maize, wheat, sugarcane, turmeric, tobacco, groundnut, sesamum, sunflower, cotton, redgram, bengalgram, blackgram, greengram, tea, soybean.

Practical: Study of symptoms, etiology, host-parasite relationship and specific control measures of the following crop diseases. Presentation of disease samples survey and collection of Diseases of rice, sorghum; Diseases of wheat, bajra & maize; Diseases of sugarcane, turmeric & tobacco; Diseases of groundnut, castor & sunflower; Diseases of sesamum & cotton; Diseases of redgram, greengram, blackgram, bengalgram & beans; Field visits at appropriate time during the semester

Note: Students should submit 50 pressed, well mounted diseased specimens in three installments during the semester.

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Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors– temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance. Concepts of Balance of life in nature, biotic potential and environmental resistance and causes for outbreak of pests in agro-ecosystem. Pest surveillance and pest forecasting. Categories of pests. IPM; Introduction, importance, concepts principles and tools of IPM-Host plant resistance, Cultural, Mechanical, Physical, Legislative, Biological (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses) methods of control. Chemical control – importance, hazards and limitations. Classification of insecticides,toxicity of insecticides and formulations of insecticides. Study of important insecticides. Botanical insecticides – neem based products, Cyclodiens, Organophosphates, Carbamates, Synthetic pyrethroids, Novel insecticides, Pheromones, Nicotinyl insecticides, Chitin synthesis inhibitors, Phenyl pyrazoles, Avermectins, Macrocytic lactones, Oxadiazimes, Thioureaderivatives, pyridine azomethines, pyrroles, etc. Nematicides, Rodenticides, Acaricides and fumigants. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation and genetic control. Practices, scope and limitations of IPM. Insecticides Act 1968 – Important provisions. Application techniques of spray fluids. Phytotoxicity of insecticides. Symptoms of poisoning, first aid and antidotes. Beneficial insects: parasites and predators used in pest control and their mass multiplication techniques. Important groups of microorganisms, bacteria, viruses and fungi used in pest control and their mass multiplication techniques. Important species of pollinators, weed killers and scavengers, their importance. Non insect pests – mites, nematology, rodents and birds. Vermiculture

Practical: Visit to meteorological observatory / automatic weather reporting station; Study of terrestrial and pond ecosystems of insects; Studies on behaviour of insects and orientation (repellency, stimulation, deterancy); Study of distribution patterns of insects, sampling techniques for the estimation of insect population and damage; Pest surveillance through light traps, pheremone traps and field incidence; Practicable IPM practices, Mechanical and physical methods; Practicable IPM practices, Cultural and biological methods; Chemical control, Insecticides and their formulations; Calculation of doses/concentrations of insecticides; Compatibility of pesticides and Phytotoxicity of insecticides; IPM case studies; Identification of common phytophagous mites and their morphological characters; Identification of common plant parasitic nematodes and their morphological characters; Identification of rodents and bird pests and their damage; Identification of earthworms in vermiculture – visit to vermiculture unit; Other beneficial insects – Pollinators, weed killers and scavengers

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Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops; Cereals: wheat, barley; Pulses: chickpea, lentil, peas, french bean; Oilseeds: rapeseed and mustard, sunflower, safflower and linseed; Sugar crops: sugarcane and sugarbeet, Medicinal and aromatic crops such as mentha, lemon grass, citronella, palmarosa, isabgol and posta; Commercial crops: potato and tobacco, Forage crops: berseem, lucerne and oat.

Practical: Seed bed preparation and sowing of wheat, sugarcane and sunflower; Calculations on seed rate; Top dressing of nitrogen in wheat and study of fertilizer experiments on wheat and mustard; Identification of weeds in wheat and grain legumes, application of herbicide and study of weed control experiments; Morphological characteristics of wheat, sugarcane, chickpea and mustard; Yield contributing characters of wheat; Yield and quality analysis of sugarcane; Crop distribution in the state and the region; Important agronomic experiments of rabi crops and visit to research stations related to rabi crops.

GEOCHEMISTRY: THEORY

Definition and Scope, Definition of Rocks and mineral, Physical Properties of mineral. Mineral Deposit, Supergene enrichment of ore deposit. Formation of different types of Rock, Interior of the Earth. Geological time Scale. Clay and Silicate minerals with their structure, charges on clay. Phase rule and mineral formation under Quartz-Coesite Transition, Nepheline – Quartz System, Albite-Anorthite solid solution.

PRACTICAL:

Identification of rocks,

Identification of minerals

Identification of Quartz, Biotite, Albite, Labradorite, Microcline etc. mineral under petrological Microscope.

Identification of Form & Relief of Quartz, Biotite, Albite, Labradorite, Microcline under petrological Microscope.

Determination of Extention angle of Quartz, Biotite, Albite, Labradorite, Microcline under petrological Microscope.

Determination of Refractive Index Quartz, Biotite, Albite, Labradorite, Microcline under petrological Microscope.

Identification of Twining in Albite, Labradorite, Microcline under petrological Microscope.

References:

1. Wedepohl, K.H. : Geochemistry, Holt, Rinehart and Winston, Inc, New York, Chicago
2. Berry, LG., Mason Brian & Dietrich, RV: Mineralogy (concept, Descriptions Determinations), CBS Publishers & Distribution, Darya Ganj, New Delhi
3. Sayeed, A. Trends in Objective Geology, CBS Publishers & Distributors PVT. Ltd., New Delhi.
4. Walter V. John: Essential of Geochemistry, Jones & Bartlett, India Pvt, Ltd., Daryaganj, New Delhi

SemesterV

AHM – 510

Animal Health Management

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Health care of Livestock, Toxic substances in feed and nutritional disorders. Sanitation and prevention of diseases, Sanitary milk production, Control of External and Internal parasites, sterility and infertility in farm animals, Role of nutrients in Animal Health and Immunity, Euthasia, General terms used, Prescription writing and common Abbreviation, common prescriptions, common tools and medicines used in Veterinary Practice, Simple ailments of farm animals, Methods of administration of drugs in farm animals, Faecal examination.

Sustainable agriculture: Introduction, definition, goal and current concepts, factors affecting ecological balance and ameliorative measures; Land degradation and conservators of natural resources, LEIA & HEIA; Irrigation problems, waste lands and their development; Organic farming: definition, principles and components; Farming systems: definition, principles and components, IFS models for wetland, irrigated dryland and dryland situations.

Practical: Preparation of cropping scheme for irrigated situations; Preparation of cropping scheme for dryland situations; Study of existing farming systems in nearby villages; Preparation of integrated farming system model for wetlands; Preparation of integrated farming system model for drylands; Preparation of enriched Farm Yard Manure; Preparation of Vermicompost; Visit to urban waste recycling unit; Study of profitable utilization of agricultural wastes; Visit to poultry and dairy units to study resource allocation, utilization and economics; Visit to an organic farm to study various components and utilization; Study of degraded lands.

A. Market Milk -

History & development of market milk industry, rural milk production, milk procurement, pricing of milk, producer's price, consumer's price, pricing on composition, species, two axis pricing system, administered price, Quality of market milk, legal standard, milk in relation to public health, categories of market milk, Preparation of milk for the market, various heat treatments, applied to milk-pasteurization, sterilization. Importance of refrigeration in market milk industry. Storage, transport and distribution of milk. Appliances used and selection of equipment for a chilling centre and a small dairy plant. Unkeep of dairy equipment, factors influencing their efficiency, cleaning and sterilization of dairy equipment. Preparation of homogenized, standardized, toned, recombined, fermented milk and sterilized milk, legal standards, packaging of milk, processing of milk, cleaning and sterilizing of dairy equipments.

B. Dairy Products Manufacture -

Cream – Principles of cream separation, preparation of cream in rural areas, manufacture of cream in the dairy, grading and defects, packing and transport, system of payment.

Butter – Treatment of cream for butter making. Modern theory of churning, starter, preparation of deshi and creamery butter, packing butter for the market, grading butter, defects in butter, their causes and remedies, judging, legal standards.

Ghee – Manufacture of ghee under rural conditions, collection of ghee from rural areas, grading of ghee. Manufacture of ghee from cream and butter by improved methods, standards for ghee, defects in market ghee; and causes and remedy, storage of ghee, Agmark specifications, judging.

Khoa Channa, Casein & Paneer – Manufacturing process, packing and storage, factors affecting quality, defects, Causes and remedy, judging, legal standards.

Ice-cream & Kulfi – Ingredients, calculations, manufacture, storage and sale defects – causes & remedies judging, legal standard.

Dahi & Srikhand – Manufacture, defects, causes and remedies.

Agribusiness: Meaning, Definition, Structure of Agribusiness, (Input, Farm, Product Sectors). Importance of Agribusiness in the Indian Economy, Agricultural Policy. Agribusiness Management, Distinctive features, Importance of Good Management, Definitions of Management. Management Functions, Planning, Meaning, Definition, Types of Plans (Purpose or Mission, Goals or Objectives, Strategies, Policies, Procedures, rules, programmes, Budget) characteristics of sound plan, Steps in planning, Organization, Staffing, Directing, Motivation, Ordering, Leading, Supervision, Communication, control. Capital Management. Financial Management of Agribusiness: Importance of Financial Statements, Balance sheet, Profit and Loss Statement, Analysis of Financial statements. Agro-based Industries: Importance and Need, Classification of Industries, Types of Agro-based Industries, Institutional arrangement, Procedure to set up agro-based industries, Constraints in establishing agro-based industries. Marketing Management: Meaning, Definitions, Marketing Mix, 4Ps of Marketing. Mix, Market segmentation, Methods of Market, Product life cycle. Pricing policy, Meaning, pricing method. Prices at various stages of Marketing. Project, definitions, project cycle, Identification, Formulation, Appraisal, Implementation, Monitoring and evaluation, Appraisal and Evaluation techniques, NPW, BCR, IRR, N/K ratio, sensitivity analysis, characteristics of agricultural projects: preparation of project reports for various activities in agriculture and allied sectors: Dairying, poultry, fisheries, agro-industries etc.

Practical: Study of input markets: seed, fertilizers, pesticides. Study of output markets, grains, fruits, vegetables, flowers. Study of product markets, retail trade commodity trading, and value added products. Study of financing institutions cooperatives commercial banks, RRBs, Agribusiness Finance Limited, NABARD; Preparations of projects, Feasibility reports; Project appraisal techniques; Case study of agro-based industries.

Extension Education and Agricultural Extension – Meaning, Definition, Scope and importance. Sociology and Rural Sociology, Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and Interrelationship between Rural Sociology & Agricultural Extension. Indian Rural Society, Important characteristics, Differences and Relationship between Rural and Urban societies. Social Groups – Meaning, Definition, Classification, Factors considered in formation and organization of groups, Motivation in group formation and Role of Social groups in Agricultural Extension. Social Stratification – Meaning, Definition, Functions, Basis for stratification, Forms of Social stratification – Characteristics and – Differences between Class & Caste System. Cultural concepts – Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions – Meaning, Definition and their Role in Agricultural Extension. Social Values and Attitudes – Meaning, Definition, Types and Role of Social Values and Attitudes in Agricultural Extension. Social Institutions – Meaning, Definition, Major institutions in Rural society, Functions and their Role in Agricultural Extension. Social Organizations – Meaning, Definition, Types of organizations and Role of Social organizations in Agricultural Extension. Social Control – Meaning, Definition, Need of social control and Means of Social control. Social change – Meaning, Definition, Nature of Social change, Dimensions of social change and factors of social change. Leadership – Meaning, Definition, Classification, Roles of a leader, Different methods of Selection of Professional and Lay leaders. Training of Leaders – Meaning, Definition, Methods of training, Advantages and Limitations in use of local leaders in Agricultural Extension. Psychology and Educational Psychology – Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension. Intelligence – Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension. Personality – Meaning, Definition, Types, Factors influencing the Personality and Role of personality in Agricultural Extension. Teaching – Learning process – Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics. Principles of learning and their implication for teaching.

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Hardy-Weinberg Law; Study in respect of origin, distribution of species, wild relatives and forms, Cereals, (rice, wheat, maize, millets, sorghum, bajra, ragi); Pulses (redgram, greengram, blackgram, soybean); Oilseeds (Groundnut, sesame, sunflower, safflower, castor, mustard) etc. Fibers (Cotton, kenaf, roselle, jute) etc. Vegetables (Tomato, bhindi, chilli, cucumbers); Flowers crops (Chrysanthemum, rose, galardia, gerbera & marigold); Fruit crops (aonla, guava, mango, custard apple, banana, papaya); Major breeding procedures for development of hybrids / varieties of various crops; Plant Genetic Resources their conservation and utilization in crop improvement; Ideotype concept in crop improvement; Breeding for resistance to biotic and abiotic stresses variability in pathogens and pests; Mechanisms of resistance in plant to pathogens and pest; Genetic basis of adaptability to unfavourable environments; Definition of biometrics, assessment of variability i.e., additive, dominance and epistasis and their differentiation; Genotype x Environment interaction and influence on yield/performance, IPR and its related issues.

Practical: Emasculation and Hybridization techniques; Handling of segregating generations, pedigree methods; Handling of segregating generations, bulk methods; Handling of segregating generations, back cross methods; Field lay out of experiments; Field trials, maintenance of records and registers; Estimation of Heterosis and inbreeding depression; Estimation of Heritability, GCA and SCA; Estimation of variability parameters; Parentage of released varieties/hybrids; Problems on Hardy, Weinberg Law; Study of quality characters; Sources of donors for different characters; Visit to seed production and certification plots; Visit to AICRP trials and programmes; Visit to grow out test plots; Visit to various research stations; Visit to other institutions

Importance of post harvest technology in horticultural crops. Maturity indices, harvesting and post harvest handling of fruits and vegetables. Maturity and ripening process. Factors affecting ripening of fruits, and vegetables. Pre harvest factors affecting quality on post harvest shelf life of fruits and vegetables. Factors responsible for deterioration of harvested fruits and vegetables. Chemicals used for hastening and delaying ripening of fruits and vegetables. Methods of storage – precooling, prestorage treatments, low temperature storage, controlled atmospheric storage, hypobaric storage, irradiation and low cost storage structures. Various methods of packing, packaging materials and transport. Packing technology for export. Fabrication of types of containers, cushioning material, vacuum packing, poly shrink packing, specific packing for export of mango, banana, grapes kinnow, sweet orange, and mandarin etc. Importance and scope of fruit and vegetable preservation in India. Principles of preservation by heat, low temperature, chemicals and fermentation. Unit layout – selection of site and precautions for hygienic conditions of the unit. Preservation through canning, bottling, freezing, dehydration, drying, ultraviolet and ionizing radiations. Preparation of jams, jellies, marmalades, candies, crystallized and glazed fruits, preserves, chutneys, pickles, ketchup, sauce, puree, syrups, juices, squashes and cordials Spoilage of canned products, biochemical, enzymatic and microbial spoilage. Preservatives, Colours permitted and prohibited in India.

Practical: Practice in judging the maturity of various fruits and vegetables. Conservation of zero energy cool chambers for on farm storage. 3& 4. Determination of physiological loss in weight (PLW), total soluble solids (TSS), total sugars, acidity and ascorbic acid content in fruits and vegetables. Packing methods and types of packing and importance of ventilation. Pre cooling packing methods for export or international trade. Methods of prolonging storage life. Effect of ethylene on ripening of banana, sapota, mango, sapota. Identification of equipment and machinery used in preservation of fruits and vegetables. Preservation by drying and dehydration. Preparation of jam, jelly and marmalades. Preparation of squash, cordials and syrups. Preparation of chutneys, pickles, sauces and ketchup. Visit to local processing units. Visit to local market yards and cold storage units. Visit to local market and packing industries.

Stored grain pests: Coleopteran and Lepidopteran pests, their biology and damage, preventive and curative methods. Distribution, biology, nature and symptoms of damage, and management strategies of insect and non insect pests of rice, sorghum, maize, ragi (*Eleusinecoracana*), wheat, sugarcane, cotton, mesta, sunhemp, pulses, groundnut, castor, gingerly, safflower, sunflower, mustard, brinjal, bhendi, tomato, cruciferous and cucurbitaceous vegetables, potato, sweet potato, colacasia, moringa, amaranthus, chillies, mango, citrus, grapevine, cashew, banana, pomegranate, guava, sapota, ber, apple, coconut, tobacco, coffee, tea, turmeric, betelvine, onion, coriander, garlic, curry leaf, pepper, ginger and ornamental plants.

Practical: Identification of pests, their damage symptoms and management of rice, sorghum, maize, wheat, sugarcane, cotton, pulses, Solanaceous and Malvaceous vegetables, cruciferous and cucurbitaceous vegetables, chilli, mango, carbon, citrus and sapota.

Economic Importance, symptoms, cause, disease cycle and integrated management of diseases of: citrus, mango, banana, grapevine, pomegranate, papaya, guava, sapota, apple, chilli, brinjal, bhendi, potato, crucifers, cucurbits, tomato, beans, onion, coconut, oil palm, betelvine, mulberry, coffee, tea, rose, chrysanthemum and jasmine.

Practical: Diseases of beans, citrus, guava, & sapota; Diseases of papaya, banana, pomegranate & ber; Diseases of mango, grapes & apple; Diseases of chilli, brinjal & bhendi; Diseases of potato, tomato & crucifers; Diseases of cucurbits, onion & betelvine; Diseases of oil palm, coconut, tea, coffee & mulberry; Diseases of rose, chrysanthemum and jasmine. Field visits at appropriate time during the semester.

Note: Students should submit 50 pressed, well mounted diseased specimens in three installments during the semester.

Introduction: Definition of Statistics and its use and limitations; Frequency Distribution and Frequency Curves; Measures of Central Tendency: Characteristics of Ideal Average, Arithmetic Mean; Median, Mode, Merits and Demerits of Arithmetic Mean; Measures of Dispersion: Standard Deviation, Variance and Coefficient of Variation; Probability: Definition and concept of probability; Normal Distribution and its properties; Introduction to Sampling: Random Sampling; the concept of Standard Error; Tests of Significance- Types of Errors, Null Hypothesis, Level of Significance and Degrees of Freedom, Steps involved in testing of hypothesis; Large Sample Test- SND test for Means, Single Sample and Two Samples (all types); Small Sample Test for Means, Student's t-test for Single Sample, Two Samples and Paired t test. F test; Chi-Square Test in 2x2 Contingency Table, Yates' Correction for continuity; Correlation: Types of Correlation and identification through Scatter Diagram, Computation of Correlation Coefficient 'r' and its testing. Linear Regression: of Y on X and X on Y. Inter-relation between 'r' and the regression coefficients, fitting of regression equations. Experimental Designs: Basic Designs, Completely Randomized Design (CRD), Layout and analysis with equal and unequal number of observations, Randomized Block Design (RBD), Layout and analysis, Latin Square Design (LSD), Layout and analysis.

Practical: Construction of Frequency Distribution Tables and Frequency Curves; Computation of Arithmetic Mean for Un-Grouped and Grouped data; Computation of Median for Un-Grouped and Grouped data; Computation of Mode for Un-Grouped and Grouped data; Computation of Standard Deviation, Variance and Coefficient of Variation for Un-Grouped and Grouped data; SND test for Means, Single Sample; SND test for Means, Two Samples; Student's t-test for Single Sample; Student's t-test for Two Samples; Paired t test and F test; Chi-Square Test in 2x2 Contingency Table, Yates' Correction for continuity; Computation of Correlation Coefficient 'r' and its testing; Fitting of regression equations- Y on X and X on Y; Analysis of Completely Randomized Design (CRD); Analysis of Randomized Block Design (RBD); Analysis of Latin Square Design (LSD).

SemesterVI

AGRN – 521

Rainfed Agriculture

2 (1+2)

Definition, problems, characteristics, drought, mechanism of drought tolerance, agro-techniques for boosting crop yields, water and moisture harvesting.

Practical

1. Selection of crops and varieties
2. Studies of mulches
3. Fertilization
4. Weed management
5. Based on theory aspects.

Introduction, concept, relevance in present context; Organic production requirements; Biological intensive nutrient management-organic manures, vermicomposting, green manuring, recycling of organic residues, biofertilizers; Soil improvement and amendments; Integrated diseases and pest management – use of biocontrol agents, biopesticides pheromones, trap crops, bird perches; Weed management; Quality considerations, certification, labeling and accreditation processors, marketing, exports.

Practical: Raising of vegetable crops organically through nutrient, diseases and pest management; vermicomposting; vegetable and ornamental nursery raising; macro quality analysis, grading, packaging, post harvest management.

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination; Weed biology and ecology, crop weed association, crop weed competition and allelopathy Concepts of weed prevention, control and eradication; Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management; Herbicides: advantages and limitation of herbicide usage in India, Herbicide classification, formulations, methods of application; Introduction to Adjuvants and their use in herbicides; Introduction to selectivity of herbicides; Compatibility of herbicides with other agro chemicals; Weed management in major field and horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

Practical: Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of herbarium of weeds; Calculations on weed control efficiency and weed index; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops; Biology of nut sedge, bermuda grass, parthenium and celosia; Economics of weed control practices; Tours and visits of problem areas.

Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implication for decision making by individual entrepreneurs. Globalization and the emerging business / entrepreneurial environment. Concept of entrepreneurs; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow-up; managing competition; entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises (SMEs) / SSIs. Export and Import Policies relevant to agriculture sector. Venture capital. Contract farming and joint ventures, public-private partnerships. Overview of Agri. Inputs industry. Characteristics of Indian agricultural processing and export industry. Social Responsibility of Business. Communication Skills: Structural and Functional grammar; meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical: Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing footnote and bibliographic procedures. Reading and comprehension of general and technical articles précis writing, summarizing, abstracting; individual and group presentations.

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Production Economics: Meaning, Definition, Nature and Scope of Agricultural Production Economics. Basic concepts and terms. Concepts of Production. Production Functions: Meaning, Definition, Types. Laws of returns: Increasing, Constant and decreasing. Factor Product Relationship. Determination of optimum input and output. Factor relationship. Product relationship. Types of enterprise relationships. Returns to scale: Meaning, Definition, Importance. Farm Management. Economic principles applied to the Organizations of farm business. Types and systems of farming. Farm planning and budgeting. Risk and uncertainty. Farm budgeting. Linear programming: Assumptions, Advantages and Limitations of Linear programming.

Practical: Computation of cost concepts; Methods of computation of depreciation; Analysis of Net worth statement; Farm inventory analysis; Preparation of farm plans and budgets; Types of farm records and accounts; Preparation of profit and loss account; Break, Even analysis; Economics analysis of different crop and livestock enterprises; Application of Farm Management Principles.

Communication – Meaning, Definition, Models, Elements and their Characteristics, Types and Barriers in communication. Extension Programme Planning – Meaning, Definitions of Planning, Programme, Project, Importance, Principles and Steps in Programme Development Process, Monitoring and Evaluation of Extension Programmes. Extension Teaching methods – Meaning, Definition, Functions and Classification. Individual contact methods – Farm and Home visit, Result Demonstration, Field trials – Meaning, Objectives, Steps, Merits and Demerits. Group contact methods – Group discussion, Method demonstration, Field Trips – Meaning, Objectives, Steps, Merits and Demerits. Small group discussion techniques – Lecture, Symposium, Panel, Debate, Forum, Buzz group, Workshop, Brain Storming, Seminar and Conference. Mass contact Methods – Campaign, Exhibition, KisanMela, Radio & Television – Meaning, Importance, Steps, Merits & Demerits. Factors influencing in selection of Extension Teaching Methods and Combination (Media Mix) of Teaching methods. Innovative Information sources – Internet, Cyber Cafes, Video and Tele conferences, Kisan call centers, Consultancy clinics. Agricultural Journalism – Meaning, Scope and Importance, Sources of news, Types, Merits and Limitations. Diffusion and Adoption of Innovations – Meaning, Definition, Models of adoption Process, Innovation – Decision Process – Elements, Adopter categories and their characteristics, Factors influencing adoption process. Capacity building of Extension Personnel and Farmers – Meaning, Definition, Types of training, Training to farmers, farm women and Rural youth – FTC and KVK.

Practical: Simulated exercises on communication. Identifying the Problems, Fixing the Priorities and selecting a most important problem for preparation of a project. Developing a project based on identified problems in a selected village. Organization of Group discussion and Method demonstration. Visit to KVK / FTC. Planning and Writing of scripts for Radio and Television. Audio Visual aids – Meaning, Importance and Classification. Selection, Planning, Preparation, Evaluation and Presentation of visual aids. Planning & Preparation of visual aids – Charts, Posters, Over Head Projector, (OHP) Transparencies, Power Point Slides. Planning and Preparation of Agricultural Information materials – Leaflet, Folder, Pamphlet, News Stories, Success Stories. Handling of Public Address Equipment (PAE) System, Still camera, Video Camera and Liquid Crystal Display (LCD) Projector.

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement: Totipotency and Morphogenesis, Nutritional requirements of in-vitro cultures; Techniques of In-vitro cultures, Micro propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture, Factors affecting above in-vitro culture; Applications and Achievements; Somaclonal variation, Types, Reasons: Somatic embryogenesis and synthetic seed production technology; Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering; Restriction enzymes; Vectors for gene transfer – Gene cloning – Direct and indirect method of gene transfer – Transgenic plants and their applications. Blotting techniques – DNA finger printing – DNA based markers – RFLP, AFLP, RAPD, SSR and DNA Probes – Mapping QTL – Future prospects. MAS, and its application in crop improvement.

Practical: Requirements for Plant Tissue Culture Laboratory; Techniques in Plant Tissue Culture; Media components and preparations; Sterilization techniques and Inoculation of various explants; Aseptic manipulation of various explants; Callus induction and Plant Regeneration; Micro propagation of important crops; Anther, Embryo and Endosperm culture; Hardening / Acclimatization of regenerated plants; Somatic embryogenesis and synthetic seed production; Isolation of protoplast; Demonstration of Culturing of protoplast; Demonstration of Isolation of DNA; Demonstration of Gene transfer techniques, direct methods; Demonstration of Gene transfer techniques, indirect methods; Demonstration of Confirmation of Genetic transformation; Demonstration of gel-electrophoresis techniques.

Comprehension: Text for comprehension, Current English for Colleges, By N. Krishnaswamy&T.Sriraman, Macmillan India Limited, Madras, 1995; War Minus shooting– The sporting spirit George Orwell (a) Reading Comprehension (b) Vocabulary – Synonyms – Antonyms – Often confused words and (c) Two exercises to help the students in the enrichment of vocabulary based on TOEFL and GRE and other competitive examinations. A Dilemma – A layman looks at science Raymond B. Fosdick (a) Reading Comprehension (b) Vocabulary – Homonyms and Homophones (c) Exercises on Figurative Language & Idiomatic Language (E.g.: dust and ashes, doorstep of doom, boundaries of knowledge, Apple of one’s eye, in a fix etc). 5&6 You and Your English – Spoken English and Broken English G.B.Shaw (a) Reading Comprehension (b) Language study, Functional Grammar, Agreement of verb with subject. Written Skills: Mechanics of good letter, Effective business correspondence, Personal Correspondence, Preparation of Curriculum vitae and Job applications. The Style, Importance of professional writing – Choice of words and Phrases, precision, conciseness clichés, redundancy, jargon, foreign words, Precis writing and synopsis writing. Interviews, Types of interviews, purpose, different settings, as interviewer, interviewee, physical makeup and manners, appearance, poise, speech, self reliance, Evaluation process, Review or feedback.

Remote Sensing: Definition, stage in remote sensing, modern remote sensing technology versus conventional aerial photography; visual image interpretation, image interpretation, basic principles of image interpretation, factors governing the quality of an image; factors governing interpretability, visibility of objects, elements of image interpretation, techniques of image interpretation, digital image processing, digital image; remote sensing in agriculture progress and prospects, microwave radiometry for monitoring agriculture crops and hydrologic forecasting; aerial photo interpretation for water resources development and soil conservation survey.

GIS: History of development of GIS definition, basic components, and standard GIS packages; data-entry, storage and maintenance; data types-spatial-non-spatial (attribute data), data structure, data format-point line vector-raster – polygon-object structural model, files, files organization-data base management systems (DBMS), entering data in computerdigitizer- scanner-data compression.

Practical: Familiarization with remote sensing and GIS hardware; use of instruments for aerial photo interpretation; interpretation of aerial photographs and satellite imagery; basic GIS operations such as image display; study the various features of GIS software package; scanning and digitization of maps; data base query and map algebra; GIS supported case studies in water resources management.

Goat:

Importance & important breeds, Breeding mgt., Feeding, care of kids & lambs, Management practices – (Tethering, age determination, disbudding, castration, hoof trimming & Goat housing), Preventive measures of diseases and vaccination.

Sheep:

Importance & important breeds, Breeding mgt., Feeding, Management practices – (lambing, care of ewe at and after lambing, Docking, Castration, Dipping) Parameter for judging wool quality. Preventive measures of diseases & vaccination.

Pigs:

Importance & important breeds, Feeding, Management of pigs, Breeding mgt. health care & vaccination.

Poultry:

Importance of poultry industry, feeding of poultry, Layer and broiler management, Grading of eggs, culling of layers, prevention & control of poultry disease.

Semester VII & VIII

RAEDP 620	Experiential Learning	20 credits	-	24 weeks
RAEDP 621	Village visit / Research Station	10 credits	-	10 weeks
RAEDP 622	In-plant training / Entrepreneurship Development	<u>10 credits</u>	-	<u>10 weeks</u>
Total		40 credits		44 weeks

Village visit and Experiential Learning will run concurrently in the 7th Semester. For inplant / Entrepreneurship training the students will be sent to different stakeholders / research centers in the 8th Semester. The students will be evaluated for each module separately as per the credit allotted for each module.