Course Curriculum of Second Semester

as per the ICAR-Sixth Deans' Committee Report for the Academic Programme in

AGRICULTURE

- **UG-Certificate in Agriculture**
- **UG-Diploma in Agriculture**
- **UG-Degree: B.Sc. (Hons.) Agriculture**

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with

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Submitted to the

Directors of Instruction and Deans (F/A) Coordination Committee

~ w.e.f. AY, 2024-25 ~

Course Curriculum of Second Semester as per the ICAR-Sixth Deans' Committee Report for Academic Programme in AGRICULTURE

Course Layout

B.Sc. (Hons.) Agriculture

Semester: II (New) ***w.e.f.*** **Academic Year: 2024-25**

Sr. No.	Course No.	Course Title	Credit Hrs.	Remark (if any)
1.	**AEC-123**	National Service Scheme (NSS-II)/ National Cadet Corps (NCC-II)	1(0+1)	--
2.	**AEC-124**	Personality Development	2(1+1)	--
3.	**VAC-121**	Environmental Studies and Disaster Management	3(2+1)	--
4.	**SOIL-122**	Soil Fertility Management	3(2+1)	--
5.	**ENTO-121**	Fundamentals of Entomology	3(2+1)	--
6.	**PATH-121**	Fundamentals of Plant Pathology	3(2+1)	--
7.	**AHDS-121**	Livestock Production and Management	2(1+1)	--
8.	**SEC-123**	Skill Enhancement Course-III# (*To be offered from the list of SEC Courses*)	2(0+2)	--
9.	**SEC-124**	Skill Enhancement Course-IV# (*To be offered from the list of SEC Courses*)	2(0+2)	--
		Total Credits Hrs.	**21(10+11)**	**G**
AEC: Ability Enhancement Course, **MDC**: Multidisciplinary Course, **SEC**: Skill Enhancement Course, **VAC**: Value Added Course, **G**: Gradial				
Post-II Semester (Only for Exit option for award of UG-Certificate)				
10.	**INT-121**	Internship (10 Weeks)	10(0+10)	--

Semester	**:**	**II**	
Course No.	**:**	**AEC-123**	**Credit Hrs. : 1 (0+1)**
Course Title	**:**	**National Service Scheme-II (NSS-II)/ National Cadet Corps-II (NCC-II)**	
Gradial Common Course across all UG Degrees			

Course No.: AEC-123	**Course Title: National Service Scheme-II (NSS-II)**	**Credit Hrs.: 1(0+1)**

SYLLABUS

Objectives :

(i) To evoke social consciousness among students through various activities viz., working together, constructive and creative social work,

(ii) To be skillful in executing democratic leadership, developing skill in program,

(iii) To be able to seek self-employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

PRACTICAL

Importance and role of youth leadership. Meaning, types and traits of leadership, qualities of good leaders; Importance and roles of youth leadership, Life competencies. Definition and importance of life competencies, Problem-solving and Decision-making, Interpersonal communication. Youth development programs Development of youth programs and policy at the national level, state level and voluntary sector; Youth-focused and youth-led organizations Health, hygiene and sanitation. Definition Needs and Scope of health education; Role of food, nutrition, safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan) for health; National health programs and reproductive health. Youth health, lifestyle, HIV-AIDS and first aid. Healthy lifestyles, HIV-AIDS, drugs and substance abuse, home nursing and first aid. Youth and yoga. History, philosophy, concept, myths and misconceptions about yoga; Yoga traditions and its impacts, Yoga as a tool for healthy lifestyle, preventive and curative method.

TEACHING SCHEDULE

PRACTICAL [AEC-123/ NSS-II]

Exercise No.	Title	Sub-topics
1	**Orientation on NSS**	Introduction to NSS, its Objectives, History and Role in community service.
2	**Youth Leadership**	Discuss the importance and role of youth leadership, types and traits of leadership and qualities of good leaders.
3	**Life Competencies**	Understanding life competencies, their importance and Practical exercises in problem-solving and decision-making.
4	**Interpersonal Communication**	Practice exercises to improve interpersonal communication skills, Focusing on active listening and effective communication.
5	**Youth Development Programs**	Overview of youth development programs, Policies at national and state levels and Understanding youth-led organizations.
6	**Health, Hygiene, and Sanitation**	Practical activities on the importance of hygiene and sanitation, including Swachh Bharat Abhiyan tasks.
7	**Nutrition and Health Education**	Discuss the role of food, nutrition, and safe drinking water in health; Explore the impact of waterborne diseases.
8	**National Health Programs**	Introduction to key national health programs and their roles in promoting public health and awareness on reproductive health.
9	**Youth Health and Lifestyle**	Sessions on healthy lifestyle choices including exercise, balanced diet and stress management.
10	**HIV/AIDS Awareness**	Educational activities on HIV/AIDS, its prevention, and reducing stigma; Awareness on reproductive health.
11	**Substance Abuse Awareness**	Discussing the dangers of drug and substance abuse, its impact on health and practical ways to prevent addiction.
12	**First Aid and Home Nursing**	Hands-on training in first aid techniques including handling injuries, CPR basics and home nursing care.
13	**Introduction to Yoga**	Introduction to the History, Philosophy and various Traditions of Yoga as a Holistic health practice.
14	**Yoga Practice**	Practical Yoga Sessions focusing on Asanas, Pranayama and Meditation for a healthy lifestyle.
15	**Yoga as Preventive and Curative Tool**	Understanding and Practicing Yoga as a preventive and curative approach for physical and mental health.
16	**Reflection on NSS and Youth Development**	Group Discussion and Reflection on the role of NSS in community building and personal growth, Focusing on youth leadership.

Course No.: AEC-123	Course Title: National Cadet Corps-II (NCC-II)	Credit Hrs.: 1(0+1)

SYLLABUS

Objectives :

i. To develop qualities of character, courage, comradeship, discipline, leadership, secular outlook, spirit of adventure and sportsmanship and the ideals of selfless service among the youth to make them useful citizen,

ii. To create a human resource of organized trained and motivated youth to provide leadership in all walks of life including the Armed Forces and be always available for the service of the nation.

PRACTICAL

Arms Drill- Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, examine arms. Shoulder from the order and vice-versa, present from the order and vice-versa. Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice- versa. Guard mounting, guard of honor, Platoon/Coy Drill. Characteristics of rifle (.22/.303/SLR), ammunition, fire power, stripping, assembling, care, cleaning, and sight setting. Loading, cocking, and unloading. The lying position and holding. Trigger control and firing a shot. Range Procedure and safety precautions. Aiming and alteration of sight. Theory of groups and snap shooting. Firing at moving targets. Miniature range firing. Characteristics of Carbine and LMG. Introduction to map, scales, and conventional signs. Topographical forms and technical terms. The grid system. Relief, contours, and gradients. Cardinal points and finding north. Types of bearings and use of service protractor. Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map. Knots and lashings, Camouflage and concealment, Explosives and IEDs. Field defenses obstacles, mines and mine lying. Bridging, waterman ship. Field water supplies, tracks and their construction. Judging distance. Description of ground and indication of landmarks. Recognition and description of target. Observation and concealment. Field signals. Section formations. Fire control orders. Fire and movement. Movement with/without arms. Section battle drill. Types of communication, media, latest trends and developments.

TEACHING SCHEDULE

PRACTICAL (AEC-123/ NCC-II)

Exercise No.	Title	Sub-topics
1	**Basic Arms Drill**	Attention, stand at ease, stand easy, getting on parade, dismissing and falling out.
2	**Advanced Arms Drill**	Ground/take up arms, examine arms, shoulder from the order and vice versa.
3	**Saluting with Arms**	Saluting at the shoulder both at a halt and while on the march.
4	**Rifle Handling Techniques**	Short/long trail from the order and vice versa, guard mounting and guard of honor procedures.
5	**Platoon and Company Drill**	Practice and demonstration of platoon and company drill formations.
6	**Rifle Characteristics and Handling**	Characteristics of rifles (.22/.303/SLR), ammunition, firepower, and basic care, cleaning, and sight setting.
7	**Rifle Operations and Safety**	Loading, cocking, unloading, safety procedures; lying position, trigger control, and firing a shot.
8	**Range Procedures and Target Practice**	Range procedures, aiming, sight alteration, theory of groups, snap shooting, and firing at moving targets.
9	**Map Reading Basics**	Introduction to maps, scales, conventional signs, topographical forms, and the grid system.
10	**Advanced Map Skills**	Relief, contours, gradients, cardinal points, bearings, and use of the service protractor.
11	**Field Navigation with Compass**	Use of prismatic compass, setting a map, finding north, positioning, map-to-ground, and ground-to-map.
12	**Field Engineering Skills**	Knots and lashings, camouflage, handling explosives, IEDs, field defenses, obstacles, and mines.
13	**Watermanship and Field Water Supplies**	Bridging techniques, field water supplies, track construction, and distance judgment.
14	**Target Recognition and Indication**	Identifying and describing targets, observing, concealment, field signals, and indication of landmarks.
15	**Section Battle Drills and Movement**	Section formations, fire control orders, fire and movement, movement with/without arms, section battle drill.
16	**Communication Skills and Modern Trends**	Types of communication, media and latest trends in NCC communication.

Semester	**:**	**II**			
Course No.	**:**	**AEC-124**	**Credit Hrs.**	**:**	**2(1+1)**
Course Title	**:**	**Personality Development**			
Gradial Common Course across all UG Degrees					

SYLLABUS

Objectives: To make students realize their potential strengths and cultivate their inter-personal skills and improve employability.

THEORY

Personality: Definition, Nature of personality, Theories of personality and its types. The humanistic approach - Maslow's self-actualization theory, Shaping of personality, Determinants of personality, Myers-Briggs Typology Indicator, Locus of control and performance, Type A and Type B Behaviours, Personality and Organizational Behaviour. Foundations of individual behavior and Factors influencing individual behavior, Models of individual behavior, Perception and Attributes; Factors affecting perception, Attribution theory and Case studies on Perception and Attribution. Learning: Meaning and Definition, Theories and Principles of Learning, Learning and Organizational behavior, Learning and Training, Learning feedback. Attitude and Values, Intelligence- Types of Intelligence, Theories of intelligence, Measurements of intelligence, Factors influencing intelligence, Intelligence and Organizational behavior, Emotional intelligence. Motivation- Theories and Principles, Teamwork and Group dynamics.

PRACTICAL

MBTI personality analysis, Learning Styles and Strategies, Motivational needs, Firo-B, Interpersonal Communication, Teamwork and team building, Group Dynamics, Win-win game, Conflict management, Leadership styles, Case studies on Personality and Organizational Behavior.

TEACHING SCHEDULE

THEORY [AEC-124]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	**Personality**	Definition, Nature of Personality	5
2	**Theories of Personality and its Types**	The Humanistic Approach- Maslow's self-actualization theory; Types- Extroversion, Introversion, Conscientiousness, Agreeableness	10
3		Shaping of Personality - improving communication skills, stepping out of comfort zone, learning to say no, tapping into creativity, getting curious, giving yourself a daily affirmation, practicing self-care. Determinants of Personality- Physical, Intellectual, Social and Psychological	10
4		Myers- Briggs Typology indicator Four Indicators- Introvert/ Extrovert, Thinking/ Feeling, Sensing/ Intuiting, Judging/ Perception, Locus of Control and Performance	10
5		Type A and Type B Behaviours Theory	5
6	**Personality and Organizational Behaviours**	Difference between Personality and Organizational behaviours	5
7		Foundations of individual behaviours, Factors influencing individual behaviour- personality, values, motivation, perspectives and social impacts	5
8		Models of Individual behaviour- Rational Economic man, Social man, The Self actuating man, Complex man	5
9	**Perception**	Attributes and Factors affecting perception; Attribution theory and Case studies on Perception and Attribution	10
10	**Learning**	Meaning, Definition; Theories and Principles of Learning	10
11		Difference between Learning and Organizational behavior; Difference between Learning and Training; Feedback of Learning	5
12	**Attitude and Values**	Meaning, Definitions, Concept	5
13	**Intelligence**	Types of Intelligence, Theories of intelligence	
14		Measurement of intelligence Factors affecting intelligence Difference between intelligence and organizational behaviour, Emotional intelligence	5
15	**Motivation**	Meaning, Theories and Principles	5
16	**Team and Group Dynamics**	Meaning, Definitions, Concept	5
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [AEC-124]

Exercise No.	Exercise Topic
1	Myers- Briggs Type Indicator (MBTI) analysis- Extroversion/ Introversion
2	Myers- Briggs Type Indicator (MBTI) analysis- Sensing/ Intuition
3	Myers- Briggs Type Indicator (MBTI) analysis- Thinking/ Feeling
4	Myers- Briggs Type Indicator (MBTI) analysis- Judging/ Perception
5	Learning Styles and Strategies
6	Motivational Needs
7	Fundamental Interpersonal Relations Orientation Behaviour (FIRO-B)
8	Interpersonal Communication
9	Team Work
10	Team Building
11	Group Dynamics
12	Win-Win Game
13	Conflict Management
14	Leadership Styles
15	Case studies on Personality
16	Case studies on Organizational Behaviour

Suggested Readings [AEC-124]:

1. Andrews, Sudhir, 1988, How to Succeed at Interviews. 21st (rep.) New Delhi. Tata - McGraw Hill.
2. Heller, Robert, 2002, Effective Leadership. Essential Manager Series. DK Publishing.
3. Hindle, Tim, 2003, Reducing Stress. Essential Manager Series. DK Publishing.
4. Kumar, Pravesh, 2005, All about Self- Motivation. New Delhi. Goodwill Publishing House.
5. Lucas, Stephen, 2001, Art of Public Speaking. New Delhi. Tata - McGraw Hill.
6. Mile, D.J., 2004, Power of Positive Thinking. Delhi. Rohan Book Company.
7. Smith, B., 2004, Body Language. Delhi: Rohan Book Company.
8. Shaffer, D. R., 2009, Social and Personality Development (6th Edn). Belmont, CA: Wadswo.

Semester	**:**	**II**	
Course No.	**:**	**VAC-121**	**Credit Hrs. : 3(2+1)**
Course Title	**:**	**Environmental Studies and Disaster Management**	
Gradial Common Course across all UG Degrees			

SYLLABUS

Objectives : 1. To expose and acquire the knowledge on the environment,

2. To gain the state-of-the-art skill and expertise on management of disasters.

THEORY

Introduction to Environment - Environmental studies - Definition, scope and importance - Multidisciplinary nature of Environmental Studies - Segments of Environment - Spheres of Earth - Lithosphere - Hydrosphere - Atmosphere - Different layers of atmosphere. Natural Resources: Classification - Forest resources. Water resources. Mineral resources, Food resources. Energy resources. Land resources. Soil resources. Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem. Types of Ecosystems. Biodiversity and its conservation: Introduction, Definition, Types. Biogeographical Classification of India. Importance and Value of Biodiversity. Biodiversity Hotspots. Threats and Conservation of Biodiversity. Environmental Pollution: Definition, Cause, Effects and Control measures of: (a) Air pollution. (b) Water pollution. (c) Soil pollution. (d) Marine pollution. (e) Noise pollution. (f) Thermal pollution. (g) Light pollution. Solid Waste Management: Classification of solid wastes and management methods, Composting, Incineration, Pyrolysis, Biogas production, Causes, Effects and Control measures of urban and industrial wastes. Social Issues and the Environment: Urban problems related to energy. Water conservation, Rain water harvesting, Watershed management. Environmental Ethics: Issues and possible solutions, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Human Population and the Environment: Environment and Human Health: Human Rights, Value Education. Women and Child Welfare. Role of Information Technology in Environment and Human health. Disaster Management – Disaster: Definition - Types - Natural Disasters: Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves. Man-made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents. International and National strategy for disaster reduction. Concept of disaster management, National disaster management framework; Financial arrangements; Role of NGOs, Community-based organizations and media in disaster management. Central, state, district and local administration in disaster control; Armed Forces in disaster response; Police and other organizations in disaster management.

PRACTICAL

Visit to a local area to document environmental assets river/forest/grassland/hill/mountain. Energy: Biogas production from organic wastes. Visit to wind mill/hydro power/solar power generation units. Biodiversity assessment in farming system. Floral and faunal diversity assessment in polluted and un polluted system. Visit to local polluted site - Urban/Rural/Industrial/Agricultural to study of common plants, insects and birds. Environmental sampling and preservation. Water quality analysis: pH, EC and TDS. Estimation of Acidity, Alkalinity. Estimation of water hardness. Estimation of DO and BOD in water samples. Estimation of COD in water samples. Enumeration of *E. coli* in water sample. Assessment of Suspended Particulate Matter (SPM). Study of simple ecosystems – Visit to pond/river/hills. Visit to areas affected by natural disaster.

TEACHING SCHEDULE

THEORY [VAC-121]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction to Environmental Studies	Definition, Scope and Importance; Multidisciplinary nature	4
2	Segments of Environment	Spheres of Earth – Lithosphere, Hydrosphere, Atmosphere and Different Layers of Atmosphere.	4
3 - 5	Natural Resources	Classification of resources; Forest, water, mineral, food, energy, land, and soil resources	10
6 - 7	Concept of an Ecosystem	Concept, Structure, Function and Energy flow in ecosystems	5
8 - 9	Types of Ecosystems	Terrestrial, Aquatic, Agroecosystems, Forest ecosystems and Human-modified ecosystems	5
10 - 12	Biodiversity and its Conservation	Importance, Value, Types, Biogeographical classification, Hotspots, Threats, Conservation strategies	8
13 - 16	Environmental Pollution	Definition, Causes, Effects, Control measures: Air, Water, Soil, Marine, Noise, Thermal and Light pollution	12
17 - 18	Solid Waste Management	Classification of solid wastes; Management methods like, Composting, Incineration, Pyrolysis, Biogas production	6
19	Urban and Industrial waste	Causes, Effects and Control measures of Urban and Industrial waste	4
20	Social Issues Related to the Environment	Urban energy problems, Water conservation, Rainwater harvesting, Watershed management	4
21 - 22	Environmental Ethics	Issues, Possible solutions, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust.	6

Continued…

23	Environment Protection Laws	Environment Protection Act, Air and Water (Pollution) Acts, Wildlife Protection Act, Forest Conservation Act	4
24 - 25	Human Population and Environment	Environment and human health, Human rights, Value education, Women and child welfare, Role of IT in environment and health	5
26 - 28	Introduction to Disaster Management	Definition, Types of natural and man-made disasters; Floods, Droughts, Cyclones, Earthquakes, Landslides, Fires	10
29 - 30	Disaster Management Framework	National and International strategies, disaster response framework, Financial arrangements, Role of NGOs and media	5
31	Central and Local Administration in Disasters	Role of Central, State, District and Local Administrations; Coordination in disaster response	4
32	Disaster Response Organizations	Central, State, District and Local Administrations in Disaster Control; Role of Armed Forces, Police and Other organizations in disaster response & control	4
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [VAC-121]

Exercise No.	Exercise Title
1	Visit to a local area to document environmental assets: River/ Forest/ Grassland/ Hill/ Mountain.
2	Visit to Biogas production, Windmill, Hydro/Solar power generation units
3	To assess floral and faunal diversity in farming systems.
4	Assessment of biodiversity in farming system.
5	Floral and faunal diversity assessment in polluted and unpolluted system.
6	Visit to Local Polluted Site - Urban/ Rural/ Industrial/ Agricultural to study the common plants, insects and birds. Environmental sampling and preservation.
7	Water quality analysis: pH and electrical conductivity (EC) in water samples.
8	Estimation of total dissolved solids (TDS) in water samples
9	Estimation of acidity and alkalinity in water samples.
10	Estimation of water hardness in water samples.
11	Determination of dissolved oxygen (DO) and biological oxygen demand (BOD) in water samples.
12	Performing COD estimation on water samples.
13	Enumeration of *E. coli* in water samples to check for contamination.
14	Assessment of Suspended Particulate Matter (SPM) in an environmental sample.
15	Study of simple ecosystem – Visit to Pond/ River/ Hills.
16	Visit to areas affected by natural disaster.

Suggested Readings (VAC-121):

1. De, A.K. 2010. Environmental Chemistry. Published by New Age International Publishers, New Delhi. ISBN:139788122426175. 384 pp.
2. Dhar Chakrabarti, P.G. 2011. Disaster Management - India's Risk Management Policy Frameworks and Key Challenges. Published by Centre for Social Markets (India), Bangaluru. 36 pp.
3. Erach Bharucha, Text Book for Environmental Studies. University Grants Commission, New Delhi.
4. Parthiban, K.T., Vennila, S., Prasanthrajan, M. and Umesh Kanna, S. 2023 Forest, Environment, Biodiversity and Sustainable development. Narendra Publishing House, New Delhi, India.
5. Prasanthrajan, M. and Mahendran, P.P. 2008. A Text Book on Ecology and Environmental Science.1st Edn. ISBN 8183211046. Agrotech Publishing Academy, Udaipur - 313 002.
6. Prasanthrajan, M. 2018. Objective Environmental Studies and Disaster Management, ISBN 9789387893825. Scientific Publishers, Jodhpur, India. 146 pp.
7. Sharma, P.D. 2009. Ecology and Environment, Rastogi Publications, Meerut, India.
8. Tyler Miller and Scot Spoolman. 2009. Living in the Environment (Concepts, Connections, and Solutions). Brooks/Cole, Cengage Learning Publication, Belmont, USA.

Semester	**:**	**II**	
Course No.	**:**	**SOIL-122**	**Credit Hrs. : 3(2+1)**
Course Title	**:**	**Soil Fertility Management**	

SYLLABUS

Objective: To provide a comprehensive knowledge and its application in respect of Soil Fertility, Plant Nutrition, Fertilizers and Nutrient Management.

THEORY

History of Soil Fertility and Plant Nutrition. Criteria of essentiality. Role, Deficiency and Toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, Factors affecting nutrient availability to plants. Chemistry of macro- and micro-nutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Introduction and importance of manures and fertilizers. Fertilizer recommendation approaches. Integrated Nutrient Management. Chemical fertilizers: Classification, Composition and Properties of Major fertilizers, Secondary and Micronutrient fertilizers, Complex fertilizers, Customized fertilisers. Water soluble fertilizers, Nanofertilizers, Soil amendments, Fertilizer Storage, Fertilizer Control Order. Methods of fertilizer recommendations to crops. Factors influencing nutrient use efficiency (NUE), Methods of application under rainfed and irrigated conditions. STCR/ RTNM/ IPNS, Carbon sequestration and Carbon Trading, Preparation and properties of major manures (FYM, Compost, Vermicompost, Green manuring, Oilcakes).

PRACTICAL

Introduction of analytical instruments and their principles, Calibration and applications of Colorimetry and Flame photometry; Estimation of alkaline hydrolysable N in soils; Estimation of soil extractable P in soils; Estimation of exchangeable K in soils; Estimation of exchangeable Ca and Mg in soils; Estimation of soil extractable S in soils; Estimation of DTPA extractable Zn in soils; Estimation of N in plants; Estimation of P in plants; Estimation of K in plants; Estimation of S in plants.

TEACHING SCHEDULE

THEORY [SOIL-122]

Lecture No.	Topic	Subtopics/ Key Points	Weightage (%)
1 - 2	History of Soil Fertility and Plant Nutrition	Definitions of Soil Fertility; History of Soil Fertility and Plant Nutritions; Role of Soil Fertility in Sustainable Agriculture	4
3 - 5	Essential Plant Nutrients	Criteria of Essentiality of Nutrients; Essential and Beneficial Nutrients and their Role; Forms of nutrients in soil and critical levels of different nutrients in soil; Deficiency and Toxicity symptoms of essential plant nutrients.	8
6 - 7	Manures and Fertilizers	Introduction and Importance of Manures and Fertilizers; Preparation and Properties of Major Manures: FYM, Compost, Vermicompost, Green Manuring, Oilcakes.	8
8	Carbon Sequestration and Carbon Trading	Definitions, Carbon cycle, Concept, Carbon sink, Types of Carbon sequestration and Carbon trading	6
9 - 11	Chemical Fertilizers; Nitrogenous fertilizers	Definition and their Classification Nitrogenous fertilizers: Classification, Composition, Properties and their Reaction in soils.	6
12 - 13	Phosphatic Fertilizers	Classification, Composition, Properties and their Reaction in soils.	6
14 - 15	Potassic Fertilizers	Classification, Composition, Properties and their reaction in soils.	6
16 - 17	Secondary and Micronutrient Fertilizers	Definitions, Types, Composition, Reaction in soil and Effect on crop growth; Soil amendments.	6
18 - 19	Complex Fertilizers	Complex fertilizers: Definition, their fate and reaction in the soil; Liquid fertilizers and Nanofertilizers	4
20	Handling and Storage of Fertilizers	Handling and Storage of Fertilizers (in detail); Fertilizer Control Order Inorganic, Organic, Inorganic or Mixed: Purpose & Key Provisions of FCO, Regulatory Bodies.	4
21 - 22	Methods of Fertilizer Recommendations in Crops	STCR, RTNM, IPNS and INM Concepts	6
23 - 24	Soil Fertility Evaluation	Soil Fertility Evaluation and Different Approaches (in detail)	6
25 - 26	Mechanism of Nutrient Uptake and Transport to Plants	Mechanism of nutrient uptake and transport to plants: Factors affecting nutrient availability to plants.	6

Continued…

27 - 28	Chemistry of Soil Nutrients	Chemistry of Soil N, P, K, Calcium, Magnesium, Sulphur and Micronutrients.	6
29	Plant Analysis and Critical Levels	Plant Analysis and Critical Levels of different Nutrients in Plant, Rapid plant tissue test and Indicator plants.	6
30	Nutrient Use Efficiency (NUE).	Definition & Factors influencing Nutrient Use Efficiency (NUE).	6
31 - 32	Methods of Nutrient Applications	Methods of Nutrient Applications for different Soils and Crops grown under Rainfed and Irrigated conditions.	6
		Total	**100**

TEACHING SCHEDULE

PRACTICAL (SOIL-122)

Exercise No.	Exercise Title
1	Introduction of analytical instruments and their principles.
2	Calibration and applications of colorimetry and flame photometry.
3	Determination of organic carbon content from soil by wet oxidation method.
4	Determination of calcium carbonate content from soil by rapid titration method.
5	Estimation of available nitrogen in soil by alkaline permanganate method.
6	Estimation of available phosphorous content in soil.
7	Estimation of available potassium in soil by flame photometric method.
8	Estimation of exchangeable calcium and magnesium in soil by Versenate titration method.
9	Estimation of available sulphur in soil by turbidimetric method.
10	Estimation of DTPA extractable micronutrients (Fe, Mn, Zn and Cu) from soil.
11	Estimation of total nitrogen in plant by micro-Kjeldhal method.
12	Estimation of total phosphorus in plant sample by Vanado molybdate method.
13	Estimation of total potassium from plant sample by flame photometric method.
14	Estimation of sulphur concentration in plant sample.
15	Estimation of total micronutrients (Fe, Mn, Cu & Zn) from plant sample.
16	Determination of organic matter from compost / FYM / oilcake by Ignition method.

Suggested Readings [SOIL-122]:

1. Dilip Kumar Das, Introductory Soil Science, Kalyani Publishers.
2. Singh, S.S. Soil Fertility and Nutrient Management, Kalyani Publishers.
3. Samual L. Tisdale, Werner L. Nelson and James D. Beaton, Soil Fertility and Fertilizers by Macmillan Publishing Company, New York.
4. Brady, N.C. 2016. The Nature and Properties of Soils. 15th edition Publisher, Pearson Education.
5. Jakson, M.L. 1973. Soil Chemical Analysis. Printice Hall, India, Pvt. Ltd. New Delhi. pp 498.
6. Piper, C.S. 1966. Soil and Plant Analysis. Inters Science. Hans Publisher, Mumbai.
7. Chopra, S.L. and Kanwar, J.S. 1991. Analytical Agricultural Chemistry, Kalyani Publisher New Delhi.

Semester	**: II**		
Course No.	**: ENTO-121**	**Credit Hrs.**	**: 3(2+1)**
Course Title	**: Fundamentals of Entomology**		

SYLLABUS

Objectives:

1. To understand the basic knowledge of Entomology and insect classification, morphology along with their relationship with other arthropods,
2. To explore insect physiology, growth, development and communication,
3. To identify major insect orders and economically important families.

THEORY

History of Entomology in India. Major points related to Dominance of Insects in Animal Kingdom. Classification of Phylum Arthropoda up to Classes. Relationship of Class Insecta with other Classes of Arthropoda. Morphology: Structure and functions of insect cuticle and moulting. Body segmentation. Structure of head, thorax and abdomen. Structure and modifications of insect antennae, Mouth parts, Legs, Wing venation, Modifications and wing coupling apparatus. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive systems in insects. Types of reproduction in insects. Major sensory organs. Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors and biotic factors. Categories of pests. Systematics: Taxonomy– importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of Class Insecta up to Orders, Basic groups of present day insects with special emphasis to Orders and Families of Agricultural importance like, Orthoptera: Acrididae, Tettigoniidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae, Trichogrammatidae, Lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

PRACTICAL

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Study of characters of Orders: Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations. Pesticide appliances and their maintenance. Sampling techniques for estimation of insect population and damage.

TEACHING SCHEDULE

THEORY [ENTO-121]

Lecture No.	Topic	Sub-topics/ Key points	Weightage (%)
1	Introduction and History of Entomology in India	Introduction; Definitions: Insect, Entomology and Agril. Entomology. History of Entomology in India including contributions of Scientists	10
	Premier Institutes concerned with Entomology	IARI, CAB, IOBC, IIIP, NBAIR, NIPHM, IISA, CIB & RC, CSB, NRIIPM, IGSMRI (Long form, Location and Role)	
2	Insect Dominance	Measures of dominance and Reasons of dominance (*in brief*)	
3	Classification of Phylum Arthropoda up to Classes	Onychophora, Crustacea, Arachnida, Chilopoda, Diplopoda, Trilobita and Hexapoda; Relationship of Class Insecta with other Classes of Arthropoda.	
4	Insect Cuticle	Structure and Functions of Cuticle, Cuticular appendages and processes; Moulting- Definition and Steps in moulting (*in brief*).	10
5	Body Segmentation	Structure of head, thorax and abdomen	
6	Insect Head	Insect Head Capsule: Important sclerites and sutures, Positions of head; Structure and modifications of insect antennae (with examples).	
7-8	Insect Mouthparts	Mouthparts and its modifications with feeding mechanisms. (Cockroach, Red cotton bug, House fly, Honeybee, Thrips and Butterfly)	
9	Insect Leg	Structure of Typical insect leg and its Modifications.	10
10	Insect Wing	Structure of wing, Modifications, Venation and Wing coupling apparatus with Examples.	
11-12	Metamorphosis	Metamorphosis: Definition, Types with examples; Significance of Insect Diapause: Definition and examples; Seasonal adaptations in insect: Aestivation Hibernation and Quiescence, Definitions, Types of larvae and pupae.	

Continued…..

13	Digestive system	Structure and Functions of digestive system in insects	10
14	Circulatory, Excretory and Respiratory systems	Structure and functions of circulatory, excretory and respiratory system in insects (*in brief*)	
15	Nervous System	Structure and Functions of Nervous System	
16	Secretary (Endocrine) System	Structure and Functions of Secretary (Endocrine) System in Insects	10
17-18	Reproductive System in Insects	Structure and functions of male and female reproductive systems; Types of reproduction in insects	
19	Major Sensory Organs	Mechanoreceptors, Chemoreceptors, Audioreceptors: Johnston's organ and Tympanum, Photoreceptors: Compound and Simple eyes, Thermo/Hygro-receptors; Sound producing organs in insects (*Only brief comments*)	
20	Insect Ecology	Introduction, Definition, Scope, Environment and its components.	10
21	Effect of Abiotic and Biotic Factors	(*Brief expln's of each factor*)- Abiotic factors: Temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Biotic factors: Food competition, Natural and Environmental resistance. Categories of Pests.	
22	Integrated Pest Management (IPM)	Concept, History, Scope, Limitations and Components of IPM	
23-24	Classification of Insecticides	Classification of insecticides- (Mode of entry, Mode of action, Chemical composition and Toxicity)	10
25	Toxicity and Formulations of Insecticides	Definitions (Toxicity, LD50, LC50, KD50, LT50, EC50, MRL, Waiting Period, Residue); Definition and types of formulations with examples (*in brief*).	
26	Systematics	Definition of Systematics, Classification, Taxonomy, Binomial nomenclature, Biotype, Sub-species, Species, Genus, Family and Order. Classification of Class Insecta upto Orders with examples.	10

Continued…..

ENTO-121…

Basic groups of present-day insects with special emphasis to following Orders and Families of Agricultural importance (with Key features in brief and examples of each) ~		
27 - 29	Orthoptera: Acrididae, Tettigoniidae, Gryllidae, Gryllotalpidae, Odonata; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae.	10
30 - 32	Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.	10
	Total=	**100**

TEACHING SCHEDULE

PRACTICAL (ENTO-121)

Exercise No.	Exercise Title
1	Methods of collection and preservation of insects including immature stages.
2	External features of Grasshopper/Cockroach.
3	Study of different types of insect antennae.
4 - 5	Study of mouth parts and its modifications (Cockroach and Red cotton bug)
6	Study of typical insect leg and its modifications.
7	Study of wing venation, types of wings and wing coupling apparatus.
8	Study of types of insect larvae and pupae.
9	Dissection of digestive, female reproductive and nervous system in insect: Cockroach.
10	Study of characters of Orders: Orthoptera, Dictyoptera, Odonata and their Families of agricultural importance.
11	Study of characters of Orders: Isoptera, Thysanoptera, Hemiptera and their Families of agricultural importance.
12	Study of characters of Orders: Lepidoptera, Neuroptera, and their Families of agricultural importance.
13	Study of characters of Orders: Coleoptera, Hymenoptera, Diptera and their Families of agricultural importance.
14	Insecticides and their formulations and Calculation of doses/concentrations of insecticides.
15	Study and Hands-on session on pesticide appliances and their maintenance.
16	Sampling techniques for estimation of insect population and damage.

Suggested Readings [ENTO-121]:

1. Imms' General Textbook of Entomology - O.W. Richards and R.G. Davies.
2. Introduction to the Study of Insects - D.J. Borror and DeLong's.
3. Fundamentals of Ecology - Eugene. P. Odum & Gray W. Barrett.
4. Integrated Pest Management Concept and Approaches- G.S. Dhaliwal and Ramesh Arora.
5. Insect Physiology and Anatomy - N.C. Pant and Swaraj Ghai.

Semester : II		
Course No. : PATH-121	**Credit Hrs. : 3 (2+1)**	
Course Title : Fundamentals of Plant Pathology		

SYLLABUS

Objectives:

1. To study the importance of plant disease epidemics and its economic impact on crops.
2. To study biotic (living), mesobiotic (viruses/viroids) and abiotic (non-living and environmental) causes of disease/ disorders.
3. To study the different types of symptoms, cause and pathogens characteristics and its reproduction.
4. To study the epidemiology of diseases.
5. To study and apply methods of management of plant diseases.

THEORY

Introduction, Scope and Objectives of Plant Pathology: Definition, Derivation and different disciplines of Plant Pathology; General Terms (glossary) commonly used in Plant Pathology; Scope and Objectives; Importance of Plant Pathology in Agriculture.

Importance of Plant Diseases: Plant disease epidemics that cause economic imbalance over the years; Historical and Present examples of losses caused by plant diseases viz. Irish famine, Bengal famine, Coffee rust, Discovery of Bordeaux mixture, Wheat rust etc.

History and Development of Plant Pathology: Important Milestones, Famous discoveries/ inventions and Contributions of National and International Phytopathologists; Development of Plant Pathology in India.

Definition and Concept of Plant Disease: Plant Disease; Conditions necessary for disease development; Disease triangle, disease tetrahedron/ pyramid concepts; Classification of diseases based on causal organism/ agent, symptoms, plant organs they affect and type of host plant affected and mode of spread & severity.

Causes of Plant Diseases and Symptoms: Plant diseases caused by abiotic and biotic agents; Diseases caused by Fungi, Bacteria, Viruses, Phytoplasmas and Phanerogamic parasites.

Diseases due to Biotic Agents: Symptoms and Signs; Hypoplasia, Hyperplasia, Hypertrophy and Necrotic symptoms caused by Fungi, Bacteria, Viruses, Phytoplasmas etc.

General Characteristics of Plant pathogens: Classification of Prokaryotes according to Bergey's Manual of Systemic Bacteriology, Classification of Fungi, Viruses and Mollicutes (Outlines).

Growth and Reproduction of plant pathogens and Replication of plant viruses: Types of growth, methods of measurement and kinetics of growth observed in pathogens; Reproduction types and reproductive structures in plant pathogens; Multiplication of plant viruses and phytoplasmas. Reproduction in bacteria.

Liberation/ Dispersal of Plant pathogens and Survival of Plant pathogens: Active and passive discharge of spores/ inoculum; mechanism of liberation; Distribution-dissemination, and direct and indirect methods of transmission; Introduction of plant diseases into India and in other countries; Survival of plant pathogens.

Types of Parasitism and Variability in Plant pathogens: Biotrophs, necrotrophs, pathotrophs, facultative saprophytes; Variability in microorganisms and its necessity for survival; Mechanisms of variability in fungi: bacteria and viruses. Mechanisms: Mutation, Recombination, Heterokaryosis, Heteroploidy, Parasexualism; Transmission, Transformation, Transduction and Conjugation.

Pathogenesis: Definition; Phenomenon of host infection/ Mechanism of infection by various plant pathogens; Avenues of penetration and defence mechanism associated with host.

Introduction to Principles of Plant Disease and Management: Principles; Integrated Disease Management (IDM); Methods of management. Introduction to Plant Disease Epidemiology, Factors governing epidemics. Classification of fungicides and antibiotics on the basis of chemical nature and mode of action.

PRACTICAL

Study of Laboratory Equipments and Microscopes, Study of symptoms and diagnosis of plant diseases; Study of disease symptoms caused by Virus, Viroids and Mollicutes; Morphological characters of Fungi, Bacteria, Virus, Viroids, and Mollicutes; Microscopic examination of plant pathogenic Fungi; Preparation of culture media and sterilization; Isolation and Purification techniques for Fungi and Bacteria; Methods of inoculation and Proving Koch's Postulates; Field/ Museum Visit to get acquainted with various plant disease symptoms. Detection of seed borne plant pathogens. Methods of seed treatment. Preparation of Bordeaux Mixture and Paste. Fungicide formulations. Plant disease assessment (Phytopathometry). Methods of application of fungicides. Use of biocontrol agents in plant disease management.

TEACHING SCHEDULE

THEORY [PATH-121]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1 - 2	**Introduction, Scope and Objectives of Plant Pathology**	Definition, Objectives of Plant Pathology; Derivation and different Disciplines of Plant Pathology; General Terms (Glossary) commonly used in Plant Pathology; Scope and Objectives.	10
3 - 4	**Importance of Plant Diseases**	Importance of Plant Pathology in Agriculture: Importance of Plant Diseases- (Crop losses, food security, environmental impact, health hazards, environmental sustainability). Plant disease epidemics that cause economic imbalance over the years; Historical and Present examples of losses caused by plant diseases viz., Irish famine, Bengal famine, Coffee rust, Discovery of Bordeaux mixture, Wheat rust etc. (*in brief*)	10
5 - 6	**History and Development of Plant Pathology**	Important Milestones, Famous Discoveries/ inventions and Contributions of National and International Phytopathologists; Development of Plant Pathology in India- (Contribution of Indian Scientists in brief)	
7 - 8	**Definition and Concept of Plant Disease**	Definition: Plant Disease; Conditions necessary for disease development: Disease triangle, Disease tetrahedron/ pyramid concepts; Classification of Plant diseases based on: Causal organism/ agent, Symptoms, Plant organs they affect and Type of host plant affected and Mode of spread & severity, etc.	10
9 - 10	**Causes of Plant Diseases and Symptoms**	Causes of Plant Disease with examples: i) Biotic causes: Eukaryotic- (Fungi, Protozoa, Algae, Nematode and Flowering parasites); Prokaryotic- (Bacteria, Fastidious vesicular bacteria, Phytoplasmas, Spiroplasmas, Actinomycetes). ii) Mesobiotic causes: iii) Abiotic causes:	5
11 - 12	**Diseases due to Biotic Agents**	Symptoms and Signs; Hypoplasia, Hyperplasia, Hypertrophy and Necrotic symptoms caused by Fungi, Bacteria, Viruses, Phytoplasmas.	5

Continued….

13 - 15	**General Characteristics of Plant Pathogens**	Outline of Classification of Plant Pathogens: Prokaryotes according to Bergey's Manual of Systemic Bacteriology, Classification of Fungi (according to Krik *et al*., 2008), Viruses and Mollicutes.	10
16 - 19	**Growth and Reproduction of Plant Pathogens and Replication of Plant Viruses**	Types of growth, Methods of measurement and Kinetics of growth observed in pathogens; Reproduction types and reproductive structures in plant pathogens; Multiplication of plant viruses and phytoplasmas; Reproduction in bacteria.	10
20 - 22	**Liberation/ Dispersal of Plant pathogens and Survival of Plant pathogens**	Active and passive discharge of spores/ inoculum; Mechanism of liberation; Distribution-dissemination (direct & indirect), Direct and indirect methods of transmission; Introduction of plant diseases into India and in other countries; Survival and perpetuation of plant pathogens.	10
23 - 25	**Types of Parasitism and Variability in Plant Pathogens**	Definitions; Biotrophs, Necrotrophs, Pathotrophs, Facultative saprophytes; Variability in microorganisms and its necessity for survival; Mechanisms of variability in fungi, bacteria, and viruses; Mechanisms: Mutation, Recombination, Heterokaryosis, Heteroploidy, Parasexualism, Transmission, Transformation, Transduction and Conjugation.	5
26 - 28	**Pathogenesis**	Pathogenesis: Definition; Phenomenon of host infection/ Mechanism of infection by various plant pathogens; Avenues of penetration and defence mechanism associated with host.	10
29 - 31	**Introduction to Principles of Plant Disease and Management**	Principles and Methods of plant disease management: Avoidance, Exclusion, Eradication, Protection (Chemical and Biological), Host resistance; Concept of Integrated Disease Management (IDM); Classification of fungicides and antibiotics on the basis of chemical nature and mode of action.	10
32	**Introduction to Plant Disease Epidemiology**	Definitions, Introduction to Plant Disease Epidemiology, Factors governing epidemics.	5
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL (PATH-121)

Exercise No.	Exercise Title
1	Study of microscope and Acquaintance with various laboratory equipments.
2	Study of different plant disease symptoms.
3	Field/ Museum visit to observe various disease symptoms.
4	Microscopic examination of diseased specimens.
5 - 6	Study of important fungal plant pathogens (*Alternaria, Botrytis, Colletotrichum, Cercospora, Curvularia, Dreschela, Fusarium, Pythium, Phytophthora,* Downy mildew and Powdery mildew genera, Smut and rust genera)
7	Preparation of culture media (PDA, NA, Oat meal Agar< Richard's medium)
8	Isolation and purification of plant pathogens.
9	Study of Koch's Postulates (Foliar and soil borne plant pathogens).
10	Detection of seed borne plant pathogens.
11	Methods of seed treatment.
12	Preparation of Bordeaux Mixture and Paste.
13	Fungicide formulations.
14	Plant disease assessment (Phytopathometry).
15	Methods of application of fungicides.
16	Use of biocontrol agents in plant disease management.

Suggested Readings [PATH-121]:

1. Pathak VN. Essentials of Plant Pathology. Prakash Publ., Jaipur.
2. Agrios GN. 2010. Plant Pathology. Acad. Press.
3. Kamat MN. Introductory Plant Pathology. Prakash Pub, Jaipur.
4. Singh RS. 2008. Plant Diseases. 8th Ed. Oxford & IBH Publ. Co.
5. Singh RS. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Publ. Co.
6. Alexopoulos, Mims and Blackwel. Introductory Mycology.
7. Mehrotra RS & Aggarwal A. 2007. Plant Pathology.7th Ed. Tata-McGraw Hill Publ. Co. Ltd.
8. Gibbs A & Harrison B. 1976. Plant Virology - The Principles. Edward Arnold, London.
9. Hull R. 2002. Mathews Plant Virology. 4th Ed. Academic Press, New York.
10. Verma JP. 1998. The Bacteria. Malhotra Publ. House, New Delhi.
11. Goto M. 1990. Fundamentals of Plant Bacteriology. Academic Press, New York.
12. Dhingra OD & Sinclair JB. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
13. Nene YL & Thapliyal PN.1993. Fungicides in Plant Disease Control. 3rd Ed. Oxford & IBH, N. Delhi.
14. Vyas SC. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.
15. Rajeev K & Mukherjee RC. 1996. Role of Plant Quarantine in IPM. Aditya Books.
16. Rhower GG. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd Ed. Vol. II. (Ed. David Pimental). CRC Press.
17. Kajal Kumar Biswas, Parimal Sinha, Pranab Dutta, Prashant P. Jambhulkar, Bishnu Maya Bashyal, Srujani Behera, Manjunath Hubballi, R. Viswanathan (2024) Concepts of Plant Pathology and Disease Management, Indian Phytopathological Society Publ., New Delhi.

Semester	**:**	**II**		
Course No.	**:**	**AHDS-121**	**Credit Hrs.**	**: 2(1+1)**
Course Title	**:**	**Livestock Production and Management**		

SYLLABUS

Objectives:

1. Provide basic knowledge to the students about scientific livestock practices
2. Entrepreneurship development through Livestock production

THEORY

Importance of livestock in the national economy and different development programmes of Govt. of India. Livestock Census and trends of livestock production. Terminology used in livestock management. Concepts of Precision livestock farming: Scope and limitations. Important Indian and exotic breeds of cattle and buffalo. Principles of maximization of livestock production. Feeding and management of calf, heifer and milking animal. Feeding and management of dry, pregnant, draft animals and breeding bull. Common diseases and its preventive, curative measures in cattle and buffalo. Bovine male and female reproductive system, fertility, sterility and reproductive behavior viz., estrus and parturition. Mammary gland and milk secretion. Organic livestock production- definition, importance, principles, standards, certifications, SWOT analysis. Effect of climate change on livestock production. Farm hygiene and their economic disposal of farm wastes. Cost of milk production, economical unit of cattle and buffalo.

PRACTICAL

External body parts of cattle and buffalo. Routine management practices followed on livestock farm. Methods of handling and restraining of animals. Methods of identification Marks and dehorning of animals. Estimation of age and body weight of animal. Recording the pulse rate, respiration rate and body temperature of animal. Preparation of feeding schedule and feeding different categories of cattle and buffalo. Clean and hygienic milk production and milking methods. Judging of animals for dairy and draft purpose. Study of computerized database on dairy farm. Vaccination and control of ecto and endo parasites in cattle and buffalo. Study of various dairy structures. Collection of semen, artificial insemination and pregnancy diagnosis in farm animal. Utilization of dairy farm wastes. Preparation of viable bank proposals for cattle and buffalo. Visit to dairy farms.

TEACHING SCHEDULE

THEORY [AHDS-121]

Lecture No.	Topic	Subtopics/ Key Points	Weightage (%)
1	Scope and Importance	Importance of Livestock in the National Economy and Different Development Programmes of Govt. of India.	8
2	Livestock Census and Trends	Livestock census and Trends of Livestock Production	4
3	Terminology in Livestock	Terminology used in Livestock Management	6
4	Precision Livestock Farming	Concepts of Precision Livestock Farming: Scope and Limitations	6
5	Cattle and Buffalo Breeds	Important Indian and Exotic Breeds of Cattle and Buffalo	10
6	Principles of Livestock Production	Principles of Maximization of Livestock Production	4
7	Feeding and Management	Feeding and Management of calf, heifer and milking animal	8
8	Feeding and Management	Feeding and Management of dry, pregnant, draft animals and breeding bull	6
9	Common Diseases	Common diseases and its Preventive and Curative measures in cattle and buffalo	7
10	Bovine Reproductive System	Bovine Male and Female Reproductive Systems	6
11	Reproductive Behavior of Animals	Fertility, Sterility and Reproductive behavior viz., Oestrus and Parturition.	7
12	Mammary Gland and Milk Secretion	Mammary gland and Milk secretion.	6
13	Organic Livestock Production	Organic Livestock Production- Definition, Importance, Principles, Standards, Certifications, SWOT Analysis	6
14	Climate Change	Effect of climate change on livestock production	6
15	Farm Hygiene	Farm hygiene and their economic disposal of farm wastes	6
16	Economics	Cost of milk production, Economical unit of cattle and buffalo	4
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL (AHDS-121)

Exercise No.	Exercise Title
1	Study of external body parts of cattle and buffalo
2	Routine management practices followed on livestock farm
3	Methods of handling and restraining of animals
4	Methods of identification Marks and dehorning of animals
5	Estimation of age and body weight of animal
6	Recording the pulse rate, respiration rate and body temperature of animal
7	Preparation of feeding schedule and feeding different categories of cattle and buffalo
8	Clean and hygienic milk production and milking methods
9	Judging of animals for dairy and draft purpose
10	Study of computerized database on dairy farm
11	Vaccination and control of ecto and endo parasites in cattle and buffalo
12	Study of various dairy structures
13	Collection of semen, artificial insemination and pregnancy diagnosis in farm animal
14	Utilization of dairy farm wastes
15	Preparation of viable bank proposals for cattle and buffalo
16	Visit to Dairy Farms

Suggested Readings: (AHDS-121)

1. G.C. Banerjee, A Text Book of Animal Husbandry.
2. Thomas C.K. and Sastry, N.S.R., Livestock Production and Management
3. Jagdish Prasad, Principles and Practices of Dairy Farm Management.
4. Thomas C.K. and Sastry N.S.R., Dairy Bovine Production.

B.Sc. (Hons.) Agriculture

[#] List/ Bouquet of Skill Enhancement Courses (SECs): Detailed Syllabi

Sr. No.	Course No.	Course Title with Title Code	Credit Hrs.
1.	**SEC-xxx**	001-Biofertilizer and Biopesticide Production	2(0+2)
2.	**SEC-xxx**	002-Mushroom Production Technology	2(0+2)
3.	**SEC-xxx**	003-Seed Production Technology	2(0+2)
4.	**SEC-xxx**	004-Post-harvest Processing Technology	2(0+2)
5.	**SEC-xxx**	Beneficial Insect Farming	2(0+2)
6.	**SEC-xxx**	Horticulture Nursery Management	2(0+2)
7.	**SEC-xxx**	Plantation Crops Production and Management	2(0+2)
8.	**SEC-xxx**	Poultry Production and Management Technology	2(0+2)
9.	**SEC-xxx**	Processing of Milk and Milk Products	2(0+2)
10.		*(To be added)*	
11.		*(To be added)*	

Note: (i) Skill Enhancement Courses can be added/offered as per the facilities and resources available at the respective universities/colleges based on the relevance to the region and the UG degree subject.

(ii) The host University/ College may also choose suitable SEC courses from those listed under other UG degree programs.

(iii) Above list/ bouquet of SEC courses is an indicative list and subject to modification as applicable therein.

(iv) In case of unavailability of the detailed course-wise syllabus/ teaching schedules of any of above SEC courses, the same can be primarily developed and followed at College/ University level in the academic year, 2024-25. However, the same can be obtained from the respective UG Degree Coordinator/ Discipline Coordinators and can be followed w.e.f. AY, 2025-26.