

KASHI NARESH UNIVERSITY, BHADOHI

Syllabus of Agriculture (w.e.f. Academic Session 2026-2027) For B.Sc. (Hons.) Ag.

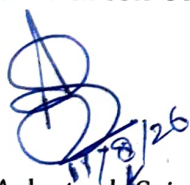
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CONTENT

Semester Wise Distribution of Courses with Credit Hours

Semester-I

Course No.	Course Title	Credit Hours
AGRNG-101	<i>Deeksharambh</i> (Induction cum Foundation course) (2 weeks Duration)	2 (0+2) (NG)
AGRNG-102A	Introductory Mathematics (need based)	1 (1+0) (NG)
AGRNG-102B	Introductory Biology (need based)	
AGR-101	Rural Sociology and Educational Psychology	2 (2+0)
AGR-102	Communication Skills	2 (1+1)
AGR-103	Fundamentals of Agronomy	3 (2+1)
AGR-104	Farming Based Livelihood Systems	3 (2+1)
AGR-105	Fundamentals of Soil Science	3 (2+1)
AGR-106	Fundamentals of Horticulture	3 (2+1)
AGRSEC-101	Skill Enhancement Course- (Mushroom Production Technology)	2 (0+2)
AGRSEC-102	Skill Enhancement Course- Vermicompost Production Technology	2 (0+2)
NSS-101/ NCC-101	National Service Scheme (NSS-I)/ National Cadet Corps (NCC-I)	1 (0+1)
Total credit hours		21(11+10)

NG: Non-gradual.

Note: Biology (PCB) and Agriculture (ABC) 10 + 2 streams Students should opt AGRNG-102 A and Maths 10 + 2 streams Students should opt AGRNG-102B.

Semester-II

Course No.	Course Title	Credit Hours
AGR-201	Personality Development	2 (1+1)
AGR-202	Environmental Studies and Disaster Management	3 (2+1)
AGR-203	Soil Fertility Management	3 (2+1)
AGR-204	Fundamentals of Entomology	3 (2+1)
AGR-205	Livestock and Poultry Management	2 (1+1)
AGR-206	Fundamentals of Plant Pathology	3 (2+1)
AGRSEC-201	Skill Enhancement Course- Beneficial Insect Farming	2 (0+2)
AGRSEC-202	Skill Enhancement Course- Production Technology of Bioagents	2 (0+2)
NSS-201/ NCC-202	National Cadet Corps-II/ National Service Scheme -II	1 (0+1)
Total credit hours		21 (10+11)



Year-I (Part-I), Semester-I

AGRNG-101 Deeksharambh (Induction-cum-Foundation Programme) 2 (0+2)

- Course Status** : Foundation Course (Non-Gradual)
- Contact Hours (L-T-P)** : 0-0-16 (2 Weks duration)
- Course Objective** :
1. To give a broad view and application areas of the subject of study.
 2. Helping students from different backgrounds for cultural Integration.
 3. Knowing about the operational framework of academic process in the university.
 4. Instilling life and social skills, leadership qualities, team working spirit.
 5. Developing social awareness, ethics and values, creativity.
 6. Helping students to identify the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario.
- Course Outcomes (CO)** :
- This course will -
1. nurture students by blossoming their hidden potentials to pursue the academic and professional studies in a diligent, honest and responsible manner.
 2. to develop a sense of integrity with diverse faculties and build linkages with peers, society and community as a whole and lastly be proficient in earning livelihood independently along with sustaining society and nature.

Course Description :

Activities:

The details of activities/ schedules will be decided by the universities/ college. The structure shall include, but not restricted to lecture schedule given below:

Theory Lecture Schedule:

S. No.	Name of Activity	No. of lecture
1.	Discussions on operational framework of academic process in the university, as well as interactions with academic and research managers of the University.	6
2.	Creating awareness on the subject of study and the traditional values, and indigenous cultures along with diverse potentialities both in indigenous and developed scenario.	8
3.	Interaction with alumni, business leaders, perspective employers, outstanding achievers in related fields and people with inspiring life experiences.	4
4.	Group activities to identify the strength and weakness of students (with expert advice for their improvement) as well as to create a platform for students to learn from each other's life experiences.	4
5.	Field visits to related fields/ establishments.	4
6.	Sessions on personality development (instilling life and social skills, social awareness, ethics and values, teamw o r k, leadership, etc.) and communication skills.	6



AGRNG-102	Introductory Mathematics	1 (1+0)
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Course Status	: Remedial Course (Non-gradual)
Contact Hours (L-T-P)	: (1-0-0)
Course Objective	: The course objective of mathematics in a B.Sc. Agriculture program typically focuses on equipping students with essential mathematical skills and a preliminary understanding of mathematics.
Course Outcomes (CO)	: CO-1: Students will grasp the definitions and characteristics of arithmetic, geometric, and harmonic progressions. Develop critical thinking and analytical skills to solve problems related to progressions in various contexts. CO-2: Fundamental understanding of Matrices, their types, and basic operations. Familiarize students with key properties of determinants to enhance their understanding of matrix theory. CO-3: Equip students with various techniques for finding derivatives. Explore practical applications of derivatives in real-world contexts, such as optimization problems (maximizing and minimizing). Introduce the concept of partial derivatives and their significance in functions of multiple variables. Students will develop a robust understanding of how differentiation applies to growth rates, costs, and revenues. CO-4: Students will gain a comprehensive understanding of integral calculus and its applications to find the area of curve. CO-5: Students will develop a comprehensive understanding of agricultural systems and the use of mathematical models, enabling them to apply these concepts effectively in research and practical applications in agriculture. Students will develop a solid understanding of how to fit linear, quadratic, and exponential models to experimental data.

Course Description

Theory:	CO Mapping
Unit 1: Algebra Progressions- Arithmetic; Geometric and Harmonic Progressions	CO-1
Unit 2: Matrices Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order by adjoint method, Properties of determinants up to 3rd order and their evaluation	CO-2
Unit 3: Differential Calculus Definition - Differentiation of function using first principle, Derivatives of sum, difference, product and quotient of two functions, Methods, Increasing and Decreasing Functions. Application of Differentiation- Growth rate, Average Cost, and Marginal cost, Marginal Cost, Marginal Revenue. Maxima and Minima of the functions of the form $y = f(x)$.	CO-3
Unit 4: Integral Calculus Integration -Definite and Indefinite Integrals-Methods- Integration by substitution, Integration by parts, Area under simple well-known curves.	CO-4
Unit 5: Mathematical Models Agricultural systems - Mathematical models - classification of mathematical models, Fitting of Linear, quadratic and exponential models to experimental data.	CO-5






Theory Lecture Schedule:

S. No.	Name of Topic	No. of lectures
1.	Progressions- Arithmetic	1
2.	Geometric and Harmonic Progressions	1
3.	Definition of Matrices, Addition, Subtraction, Multiplication	1
4.	Transpose and Inverse up to 3rd order by adjoint method	1
5.	Properties of determinants up to 3rd order and their evaluation	1
6.	Definition - Differentiation of function using first principle	1
7.	Derivatives of sum, difference, product and quotient of two functions	1
8.	Methods, Increasing and Decreasing Functions	1
9.	Application of Differentiation- Growth rate, Average Cost, and Marginal cost, Marginal Cost, Marginal Revenue	1
10.	Maxima and Minima of the functions of the form $y = f(x)$.	1
11.	Integration -Definite and Indefinite Integrals-Methods	1
12.	Integration by Substitution	1
13.	Integration by parts	1
14.	Definite Integration, Area under simple well-known curves	1
15.	Agricultural systems - Mathematical models - classification of mathematical models	1
16.	Fitting of Linear, quadratic and exponential models to experimental data.	1

Suggested Readings:

Gokhroo, D. C. and Jain, Krishi Ganita, Alka Publication, Ajmer.

1. Gokhroo, D.C. Differential calculus.
2. Gokhroo, D.C. Integral calculus.
3. Pandey R.K. Basic Mathematics.

AGRNG-102	Introductory Biology	1 (1+0)
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Course Status : Remedial Course (Non-Gradual)

Contact Hours (L-T-P) : (1-0-1)

Course Objective:

The course aims to provide students with a fundamental understanding of living organisms, their diversity, structure, functions, growth, reproduction, classification, and ecological interactions. It also introduces basic concepts of plant morphology, taxonomy, cell biology, and the role of animals in agriculture to build a strong foundation for agricultural sciences.

Course Outcomes (CO)

CO-1: Students will understand the diversity and characteristics of living organisms, origin and evolution of life, principles of biological classification, and binomial nomenclature.

CO-2: Students will acquire knowledge of cell structure, cell division, morphology of flowering plants, and seed germination.

CO-3: Students will understand the taxonomy, distinguishing characteristics, and economic importance of the families Brassicaceae, Fabaceae, and Poaceae.

CO-4: Students will recognize the role of animals in agriculture and understand their contribution to sustainable agricultural production.

CO-5: Students will develop practical skills in identifying plant organs, studying plant anatomy, cell division, plant families, and microscopic specimens.

Course Description



Unit	Contents	CO Mapping
Unit 1: Introduction to the Living World	Diversity and characteristics of life, Origin of life, Evolution, Eugenics, Binomial nomenclature and biological classification.	CO-1
Unit 2: Cell Biology and Plant Morphology	Cell structure, Cell division, Morphology of flowering plants, Seed and seed germination.	CO-2
Unit 3: Plant Systematics	Plant taxonomy and systematic study of Brassicaceae, Fabaceae and Poaceae with their diagnostic characters and economic importance.	CO-3
Unit 4: Animals in Agriculture	Role of animals in agriculture and sustainable farming systems.	CO-4
Unit 5: Practical Biology	Morphology of flowering plants; modifications of root, stem and leaf; inflorescence, flower and fruits; tissues; cell division; internal structure of root, stem and leaf; study of specimens and slides; identification and description of Brassicaceae, Fabaceae and Poaceae.	CO-5

Theory Lecture Schedule

S. No.	Name of Topic	No. of Lectures
1	Diversity and characteristics of living organisms	1
2	Origin of life, Evolution and Eugenics	1
3	Binomial nomenclature and biological classification	1
4	Cell structure	1
5	Cell division	1
6	Morphology of flowering plants	1
7	Seed structure and seed germination	1
8	Plant taxonomy and systematics	1
9	Family Brassicaceae	1
10	Family Fabaceae	1
11	Family Poaceae	1
12	Economic importance of the three plant families	1
13	Role of animals in agriculture	1
14	Principles of plant identification and classification	1
15	Review of biological concepts	1
16	Tutorial/Revision	1

Practical Schedule






S. No.	Practical Exercise	No. of Practical Classes
1	Study of morphology of flowering plants	1
2	Modifications of root	1
3	Modifications of stem	1
4	Modifications of leaf	1
5	Study of inflorescence	1
6	Study of flowers	1
7	Study of fruits	1
8	Study of plant cell and tissues	1
9	Cell division (mitosis/meiosis) using prepared slides	1
10	Internal structure of root	1
11	Internal structure of stem	1
12	Internal structure of leaf	1
13	Identification of Brassicaceae specimens	1
14	Identification of Fabaceae specimens	1
15	Identification of Poaceae specimens	1
16	Spotting of specimens and slides/Viva	1

Suggested Readings

1. Raven, P.H., Evert, R.F. & Eichhorn, S.E. **Biology of Plants**. W.H. Freeman.
2. Pandey, B.P. **Botany for Degree Students**. S. Chand & Company.
3. Singh, V., Pandey, P.C. & Jain, D.K. **A Textbook of Botany**. Rastogi Publications.
4. Sharma, O.P. **Plant Taxonomy**. McGraw Hill Education.
5. Verma, V. **Cell Biology, Genetics and Evolution**. S. Chand.
6. Taiz, L. & Zeiger, E. **Plant Physiology and Development**. Sinauer Associates.
7. Kumar, H.D. **Modern Concepts of Botany**. Vikas Publishing House.
8. Sinha, R.K. **Basic Biology for Agriculture**. CBS Publishers & Distributors.
9. Singh, G. **Plant Systematics: Theory and Practice**. Oxford & IBH.
10. Jain, V.K. **Fundamentals of Botany**. S. Chand & Company.

AGR-101	Rural Sociology and Educational Psychology	2 (2+0)
Course Status	: Core	
Contact Hours (L-T-P)	: 2-0-0	
Course Objective	: To introduce the students to Rural Sociology and Educational Psychology so that students can communicate with farmer and easily implement agricultural policies.	
Course Outcomes (CO)	: After the completion of this course, the student will be able to - CO-1: Learn about rural sociology & extension education. CO-2: Understand sociocultural dynamics. CO-3: Learn about leadership. CO-4: Understand psychological concepts. CO-5: Apply teaching and learning process.	

Course Description :

Theory:	CO Mapping
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Unit 1: Foundations of Extension Education and Rural Sociology in Agricultural Extension 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 and Agricultural Extension. Indian Rural Society: important characteristics, differences and relationship between rural and urban societies. Social Groups: Meaning, definition, classification, factors considered information and organization of groups, motivation in group formation, 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 and caste system.	CO-1
Unit 2: Sociocultural Dynamics in Agricultural Extension Cultural concepts: culture, customs, folkways, mores, taboos, rituals. 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.	CO-2
Unit 3: Leadership Leadership: Meaning, definition, classification, roles of 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.	CO-3
Unit 4: Psychological Foundations 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.	CO-4
Unit 5: Teaching and Learning Process in Agricultural Education Teaching: Learning process: Meaning and definition of teaching, learning experience and learning situation, elements of learning situation and its characteristics. Principles of learning and their implication of teaching.	CO-5

Theory Lecture Schedule:

S. No.	Name of Topic	No. of lecture
1.	Extension Education and Agricultural Extension: Meaning, definition, scope, and importance.	1
2.	Sociology and rural sociology: Meaning, definition, scope, importance of rural sociology in Agricultural Extension, and interrelationship between rural sociology and Agricultural Extension	2
3.	Indian Rural Society: important characteristics, differences and relationship between rural and urban societies.	2
4.	Social Groups: Meaning, definition, classification, factors considered information and organization of groups, motivation in group formation, motivation in group formation and role of social groups in Agricultural Extension.	2






5.	Social Stratification: Meaning, definition, functions, basis for stratification, forms of social stratification, characteristics and differences between class and caste system.	2
6.	Cultural concepts: culture, customs, folkways, mores, taboos, rituals. Traditions: Meaning, definition and their role in Agricultural Extension.	2
7.	Social Values and Attitudes: Meaning, definition, types and role of social values and attitudes in agricultural Extension.	2
8.	Social Institutions: Meaning, definition, major institutions in rural society, functions, and their role in agricultural Extension.	2
9.	Social Organizations: Meaning, definition, types of organizations and role of social organizations in agricultural Extension.	2
10.	Social Control: Meaning, definition, need of social control and means of social control.	2
11.	Social change: Meaning, definition, nature of social change, dimensions of social change and factors of social change.	2
12.	Leadership: Meaning, definition, classification, roles of leader, different methods of selection of professional and lay leaders.	2
13.	Training of Leaders: Meaning, definition, methods of training, Advantages and limitations in use of local leaders in Agricultural Extension,	1
14.	Psychology and educational psychology: Meaning, definition, scope, and importance of educational psychology in Agricultural Extension.	2
15.	Intelligence: Meaning, definition, types, factors affecting intelligence and importance of intelligence in Agricultural Extension.	2
16.	Personality: Meaning, definition, types, factors influencing the personality and role of personality in agricultural Extension.	2
17.	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 of teaching.	2

Suggested Readings:

1. A. R. Desai - Rural Sociology in India.
2. Dahama O. P. and Bhatnagar, O. P. - Education and Communication for Development.
3. J.B. Chitambar -Introductory Rural Sociology.
4. M.B. Ghorpade- Essential of psychology.
5. R Velusamy - Textbook on Rural Sociology and Educational Psychology.
6. Ray, G. L. - Extension Communication and Management.
7. Sandhu A. S. -Textbook on Agricultural Communication.

AGR-102	Communication Skills	2 (1+1)
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Course Status	: Common Course
Contact Hours (L-T-P)	: 1-0-2
Course Objective	: To acquire competence in oral, written and non-verbal communication, develop strong personal and professional communication and demonstrate positive group communication.
Course Outcomes (CO)	: After the completion of this course, the student will be able to - CO-1: Understand effective communication. CO-2: Develop communication skills. CO-3: Apply grammar fundamentals.

Course Description :



Theory:	CO Mapping
Unit 1: Communication Process The magic of effective communication; Building self-esteem and overcoming fears; Concept, nature and significance of communication process; Meaning, types and models of communication; Verbal and non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication.	CO-1
Unit 2: Basic Communication Skills Listening, Speaking, Reading and Writing Skills; Precis writing/ Abstracting/ Summarizing; Style of technical communication Curriculum vitae/ resume writing; Innovative methods to enhance vocabulary, analogy questions.	CO-2
Unit 3: Structural and Functional Grammar Sentence structure, modifiers, connecting words and verbal's; phrases and clauses; Case: subjective case, possessive case; objective case. Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles. Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults.	CO-3

Practical:

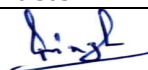
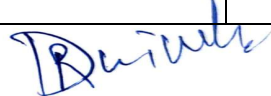
Listening and note taking, Writing skills: precis writing, summarizing and abstracting, Reading and comprehension (written and oral) of general and technical articles, Micro-presentations and Impromptu Presentations: Feedback on presentations, Stage manners: grooming, body language, voice modulation, speed, Group discussions; Public speaking exercises; vocabulary building exercises, Interview Techniques, Organization of events.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of lecture
1.	The magic of effective communication.	1
2.	Building self-esteem and overcoming fears.	1
3.	Concept, nature and significance of communication process; Meaning, types and models of communication.	1
4.	Verbal and non-verbal communication.	1
5.	Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication.	1
6.	Listening, Speaking, Reading and Writing Skills.	1
7.	Precis writing/ Abstracting/ Summarizing; Style of technical communication Curriculum vitae/resume writing.	1
8.	Innovative methods to enhance vocabulary, analogy questions.	1
9.	Sentence structure, modifiers, connecting words and verbal's; phrases and clauses.	2
10.	Case: subjective case, possessive case; objective case.	2
11.	Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles.	2
12.	Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults.	2

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Listening and note taking.	2
2.	Writing skills: precis writing, summarizing and abstracting.	2
3.	Reading and comprehension (written and oral) of general and technical articles.	2
4.	Micro-presentations and Impromptu Presentations: Feedback on presentations.	2
5.	Stage manners: grooming, body language, voice modulation, speed.	2
6.	Group discussions; Public speaking exercises; vocabulary building exercises.	2

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7.	Interview Techniques.	2
8.	Organization of events.	2

Suggested Readings:

1. Allport, G. W. Personality: A Psychological Interpretation.
2. Brown Michele and Gyles Brandreth. How to Interview and be Interviewed.
3. Carnegie Dale The Quick and Easy Way to Effective Speaking.
4. Francis Peter, S. J. Soft Skills and Professional Communication.
5. Kumar, S. and Pushpa Lata. Communication Skills.
6. Neuliep James, W. Intercultural Communication A Contextual Approach.
7. Pease, Allan. Body Language.
8. Raman, M. and Singh, P. Business Communication.
9. Seely, J. Oxford Guide to Effective Writing and Speaking.
10. Thomson, A. J. and Martinet, A. V. A Practical English Grammar.

AGR-103	Fundamentals of Agronomy	3 (2+1)
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Course Status	:	Core
Contact Hours (L-T-P)	:	2-0-2
Course Objective	:	To impart the basic and fundamental knowledge of Agronomy.
Course Outcomes (CO)	:	After the completion of this course, the student will be able to learn about
		CO-1: Explain the knowledge gained on the principle of agronomy with other disciplines of agriculture science.
		CO-2: Recognize the various nutrients and their effects on plant health.
		CO-3: To know about water budgeting and soil moisture constants.
		CO-4: Identification of weeds and their management.
		CO-5: Plan for sustainable agriculture production .

Course Description :

Theory:	CO Mapping
Unit 1: Introduction to Agronomy and its scope Agronomy and its scope: Definition, meaning and scope of Agronomy; art, science and business of crop production, relation of Agronomy with other disciplines of Agricultural Science, fields crops and classification, importance, ecology and ecosystem. Seeds and sowing: Definitions of crops, variety and seed. Factors affecting crop stands establishment: good quality seed, proper tillage, time of sowing seed rate, depth and method of sowing: broadcasting, drilling, dibbling, transplanting etc. Tillage and till: Definition, objectives, types, advantages and disadvantages of tillage including conservation tillage. Crop density and geometry: plant geometry and planting geometry, its effect on growth, yield.	CO-1
Unit 2: Crop nutrition Definition of essential nutrients, criteria of essentiality, functional nutrients, classification of essential nutrients, role of macro and micro nutrients. Nutrient absorption, active and passive absorption of nutrients, forms of plant nutrients absorbed by plants, Combined /uncombined forms. Manures and fertilizers, nutrient use efficiency: Sources of nutrients: Inorganic (fertilizers), organic (manures) and bio-fertilizers; their classification and characteristics, method of preparation and role of organic manures in crop production. Integrated Nutrient Management (INM): Meaning, different approaches and advantages of INM. Green manure- role in crop production: Definition, objectives types of green manuring, desirable characteristics, advantages and limitations of green manuring.	CO-2

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Unit 3: Water management Water resources of the world, India and the state; Soil Moisture constants: gravitational water, capillary water, hygroscopic water, Soil moisture constants	CO-3
Unit 4: Weed management Definition, Importance and basics of classification of weeds and their control. Agroclimatic zones of India and the state, cropping systems: Factors affecting cropping systems, major cropping patterns and systems in the country.	CO-4
Unit 5: Sustainable crop production Definition, importance and practices, natural resources and conservation pollution and pollutants, Allelopathy: Meaning and importance in crop production, Growth and development of crops: Definition, Meaning and factors affecting growth and development.	CO-5

Practical:

A visit to Instructional Crop farm and study on field crops, Identification of crops, seeds, fertilizers, pesticides, Crops and cropping systems in different Agro-climatic zones of the state, Study of some preparatory tillage implements, Study of inter tillage implements, Practice of ploughing / puddling, Study and practice of inter cultivation in field crops, Numerical exercises on calculation of seed, plant population and fertilizer requirement, Study of yield contributing characters and yield estimation of crops, Identification of weeds in different crops, Seed germination and viability test of seed, Practice on time and method of application of manures and fertilizers.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of lecture
1.	Agronomy and its scope: Definition, meaning and scope of Agronomy; art, science and business of crop production.	1
2.	Relation of Agronomy with other disciplines of Agricultural Science.	1
3.	Fields crops and classification, importance, ecology and ecosystem.	1
4.	Seed; Definition of crops, variety and seed, Types of seeds, dormancy of seeds.	1
5.	Factors affecting crop stands establishment: good quality seed, proper tillage, time of sowing and seed rate.	1
6.	Viability of seeds, seed treatment.	1
7.	Sowing- Methods, depth, plant density.	1
8.	Tillage- Definition, objectives, types, advantages and disadvantages of tillage including conservation tillage.	1
9.	Tilth- Definition and characteristics of good tilth.	1
10.	Crop density and geometry; plant geometry and planting geometry, its effect on growth, yield.	1
11.	Crop nutrition- Definition of essential nutrients, criteria of essentiality, functional elements, classification of essential nutrients.	2
12.	Role of macro and micro nutrients.	1
13.	Nutrient absorption, active and passive absorption of nutrients, forms of plant nutrients absorbed by plants, Combined /uncombined forms.	2
14.	Manures and fertilizers.	2
15.	Nutrient use efficiency and Sources of nutrients: Inorganic (fertilizers), organic (manures) and bio-fertilizers; their classification and characteristics.	2
16.	Method of preparation and role of organic manures in crop production	1
17.	Integrated Nutrient Management (INM): Meaning, different approaches and advantages of INM.	1
18.	Green manure- role in crop production: Definition, objectives types of green manuring, desirable characteristics, advantages and limitations of green manuring.	1
19.	Water management: Water resources of the world, India and the state.	1
20.	Soil Moisture constants: gravitational water, capillary water, hygroscopic water, Soil moisture constants.	1

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21.	Weeds – Definition, importance and classification.	1
22.	Weed control methods.	1
23.	Agroclimatic zones of India and the state.	1
24.	cropping systems: Factors affecting cropping systems, major cropping patterns and systems in the country.	1
25.	Sustainable crop production: Definition, importance and practices.	1
26.	Natural resources and conservation pollution and pollutants.	1
27.	Allelopathy: Meaning and importance in crop production.	1
28.	Growth and development of crops: Definition, Meaning and factors affecting growth and development.	1

Practical Schedule:

S. No.	Name of Topic	No. of Practical
1.	A visit to Instructional Crop farm and study on field crops.	1
2.	Identification of crops, seeds, fertilizers and pesticides.	1
3.	Crops and cropping systems in different Agro-climatic zones of the state.	1
4.	Study of some preparatory tillage implements.	1
5.	Study of inter tillage implements.	1
6.	Practice of ploughing / puddling.	2
7.	Study and practice of inter cultivation in field crops.	1
8.	Numerical exercises on calculation of seed and plant population.	1
9.	Numerical exercises on fertilizer requirement of crops.	1
10.	Study of yield contributing characters and yield estimation of crops.	1
11.	Identification of weeds in different crops.	1
12.	Seed germination and viability test of seed.	2
13.	Practice on time and method of application of manures and fertilizers.	2

Suggested Readings:

1. Rao V S. 1992. Principles of Weed Science. Oxford and IBH Publishing Co. Ltd. New Delhi.
2. Reddy Yellamanda T and Shankara Reddy G H. 2023 (6th Edition). Principles of Agronomy. Kalyani Publishers, Ludhiana.
3. Reddy, S. R. 2008. Principle of Crop Production, Kalyani Publisher, Ludhiana.
4. William L Donn. 1965. Meteorology. McGraw-Hill Book Co. New York.
5. Yawalkar K S and Agarwal J P. 1977. Manures and Fertilizers. Agricultural Horticultural Publishing House, Nagpur Rao, V. S. 1992. Principles of Weed Science. Oxford and IBH Publishing Co. Ltd. New Delhi.

AGRON-104	Farming Based Livelihood System	3 (2+1)
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Course Status : Common Course

Contact Hours (L-T-P) : **2-0-2**

Course Objective:

1. To make the students aware about farming-based livelihood systems in agriculture.
2. To disseminate the knowledge and skill how farming-based systems can be a source of livelihood.

Course Outcomes (CO) : After the completion of this course, the student will be able -

CO-1: To aware about agriculture status and farming systems in India.

CO-2: To know the components and enterprises of farming

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systems.

CO-3: To understand feasibility of different models through case studies.

CO-4: To know about innovative initiatives taken by public and private sector in 21st Century.

Course Description :

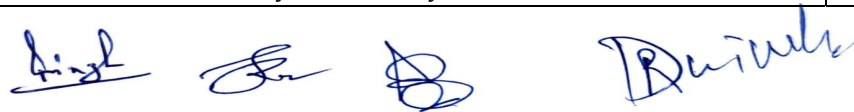
Theory:	CO Mapping
Unit 1: Introduction Status of agriculture in India and different states, Income of farmers and rural people in India, Livelihood-Definition, concept and livelihood pattern in urban and rural areas, Different indicators to study livelihood systems. Agricultural livelihood systems (ALS): Meaning, approach, approaches and framework, Definition of farming systems and farming based livelihood systems Prevalent Farming systems in India contributing to livelihood. Types of traditional and modern farming systems.	CO-1
Unit 2: Component and enterprises of farming system Components of farming system/ farming-based livelihood systems- Crops and cropping systems, Livestock (Dairy, Piggery, Goatry, Poultry, Duckry etc.), Horticultural crops, Agro-forestry systems, Aqua culture Duck/Poultry cum Fish, Dairy cum Fish, Piggery cum Fish etc., Small-, medium- and large-enterprises including value chains and secondary enterprises as livelihood components for farmers, Factors affecting integration of various enterprises of farming for livelihood.	CO-2
Unit 3: Feasibility, models and case studies of farming system Feasibility of different farming systems for different agro-climatic zones, Commercial farming-based livelihood models by NABARD, ICAR and other organizations across the country, Case studies on different livelihood enterprises associated with the farming.	CO-3
Unit 4: Initiatives taken by public and private sector in 21st Century Risk and success factors in farming-based livelihood systems, Schemes and programs by Central and State Government, Public and Private organizations involved in promotion of farming-based livelihood opportunities. Role of farming-based livelihood enterprises in 21 st Century in view of circular economy, green economy, climate change, digitalization and changing life style	CO-4

Practical:

Survey of farming systems and agricultural based livelihood enterprises, Study of components of important farming based livelihood models/ systems in different agro-climatic zones, Study of production and profitability of crop based, livestock based, processing based and integrated farming based livelihood models, Field visit of innovative farming system models. Visit of Agri-based enterprises and their functional aspects for integration of production, processing and distribution sectors and Study of agri-enterprises involved in industry and service sectors (Value Chain Models), Learning about concept of project formulation on farming-based livelihood systems along with cost and profit analysis, Case study of Start-Ups in agri-sectors.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of lecture
1.	Status of agriculture in India and different states.	1
2.	Income of farmers and rural people in India.	1
3.	Livelihood-Definition, concept and livelihood pattern in urban and rural areas.	1
4.	Different indicators to study livelihood systems.	1

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5.	Agricultural livelihood systems (ALS): Meaning, approaches and framework.	2
6.	Definition of farming systems and farming based livelihood systems.	1
7.	Prevalent Farming systems in India contributing to livelihood.	1
8.	Types of traditional and modern farming systems.	1
9.	Components of farming system/ farming-based livelihood systems- Crops and cropping systems, Livestock (Dairy, Piggery, Goatry, Poultry, Duckry etc.).	2
10.	Horticultural crops, Agro--forestry systems.	1
11.	Aqua culture Duck/Poultry cum Fish, Dairy cum Fish, Piggery cum Fish etc.	2
12.	Small-, medium- and large- enterprises including value chains and secondary enterprises as livelihood components for farmers.	2
13.	Factors affecting integration of various enterprises of farming for livelihood.	
14.	Feasibility of different farming systems for different agro-climatic zones.	1
15.	Commercial farming-based livelihood models by NABARD, ICAR and other organizations across the country.	2
16.	Case studies on different livelihood enterprises associated with the farming.	2
17.	Risk and success factors in farming-based livelihood systems.	1
18.	Schemes and programs by Central and State Government in promotion of farming-based livelihood opportunities.	2
19.	Schemes and programs by Public and Private organizations involved in promotion of farming-based livelihood opportunities.	2
20.	Role of farming-based livelihood enterprises in 21 st Century in view of circular economy.	1
21.	Green economy.	1
22.	Climate change: Causes and its impact on agriculture.	1
23.	Digitalization and changing life style.	2

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Survey of farming systems and agricultural based livelihood enterprises.	1
2.	To study the agro-climatic zones of India and Rajasthan.	1
3.	Study of components of important farming based livelihood models/ systems in different agro-climatic zones.	1
4.	Study of components of important farming based livelihood.	1
5.	Study of production and profitability of crop based system/models.	1
6.	Study of production and profitability of livestock based system/models.	1
7.	Study of production and profitability of processing based livelihood models.	1
8.	Study of production and profitability of integrated farming based livelihood models.	1
9.	Field visit of innovative farming system models.	1
10.	Visit of Agri-based enterprises and their functional aspects for integration of production, processing and distribution sectors.	1
11.	Study of agri-enterprises involved in industry and service sectors.	2
12.	Learning about concept of project formulation on farming-based livelihood systems.	1
13.	Cost and profit analysis of project formulation on farming-based livelihood systems.	1
14.	Case study of Start-Ups in agri-sectors.	2

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Dr. V. K. Singh

Suggested Readings:

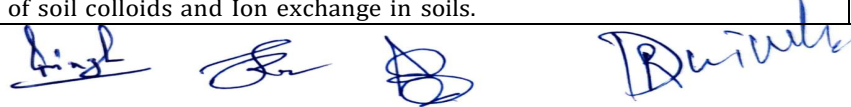
1. Ashley, C. and Carney, D. 1999. Sustainable Livelihoods: Lessons from Early Experience; Department for International Development: London, UK; Volume 7. [Google Scholar].
2. Agarwal, A. and Narain, S. 1989. Towards Green Villages: A strategy for Environmentally, Sound and Participatory Rural Development, Center for Science and Environment, New Delhi, India.
3. Carloni, A. 2001. Global Farming Systems Study: Challenges and Priorities to 2030 Regional Analysis: Sub-Saharan Africa, Consultation Document, FAO, Rome, Italy.
4. Dixon, J. and A. Gulliver with D. Gibbon. 2001. Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World. FAO & World Bank, Rome, Italy & Washington, DC, USA.
5. Evenson, R.E. 2000. Agricultural Productivity and Production in Developing Countries'. In FAO, The State of Food and Agriculture, FAO, Rome, Italy.
6. Livelihood Improvement of Underprivileged Farming Community: Some Experiences from Vaishali, Samastipur, Darbhanga and Munger Districts of Bihar by B. P. Bhatt, Abhay Kumar, P.K. Thakur, Amitava Dey Ujjwal Kumar, Sanjeev Kumar, B.K. Jha, Lokendra Kumar, K. N. Pathak, A. Hassan, S. K. Singh, K. K. Singh and K. M. Singh ICAR Research Complex for Eastern Region ICAR Patna, P.O. Bihar Veterinary College, Patna - 800 014, Bihar.
7. Panwar et al. 2020. Integrated Farming System models for Agricultural Diversification, Enhanced Income and employment, Indian Council of Agricultural Research, New Delhi.
8. Reddy, S.R. 2016. Farming System and Sustainable Agriculture, Kalyani Publishers, New Delhi.
9. Singh, J.P., et al. 2015. Region Specific Integrated Farming System Models, ICAR-Indian Institute of Farming Systems Research, Modipuram.
10. Walia, S. S. and Walia, U. S. 2020. Farming System and Sustainable Agriculture, Scientific Publishers, Jodhpur, Rajasthan.

AGR-105	Fundamentals of Soil Science	3 (2+1)
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Course Status	: Core
Contact Hours (L-T-P)	: 2-0-2
Course Objective	: To impart knowledge on soil genesis, basic soil properties with respect to plant growth.
Course Outcomes (CO)	: After the completion of this course the student will be able to learn- CO-1: Comprehensive knowledge of soil genesis, formation processes, composition and properties. CO-2: Knowledge of soil basic properties including physical and chemical soil properties. CO-3: Knowledge of classification and soil taxonomy.

Course Description :

Theory:	CO Mapping
Unit 1: Soil Fundamentals and Formation Soil-Pedological and edaphological concepts, rocks and minerals, Weathering, Soil formation, Pedogenic processes, Soil profile.	CO-1
Unit 2: Clay mineral and soil colloids Silicate clays: constitution and properties. Sources of charge, ion exchange, cation and anion exchange capacity. Soil colloids: inorganic and organic, Properties of soil colloids and Ion exchange in soils.	



Unit 3: Soil physical properties Soil texture, soil structure. Bulk density and particle density, soil consistency, soil temperature, soil air, soil water.	CO-2
Unit 4 Soil organic matter and chemical properties Soil organic matter, Soil reaction and buffering capacity.	
Unit 5 Soil taxonomy and classification Soil taxonomy, keys to soil orders. Soils of India.	CO-3

Practical:

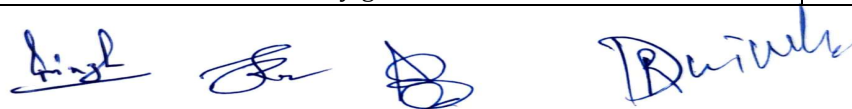
Study of general properties of minerals, study of minerals-silicate and non-silicate minerals, study of rocks-igneous, sedimentary and metamorphic rocks; study of a soil profile, collection and processing of soil for analysis, study of soil texture-feel method, mechanical analysis, determination particle density and soil porosity, determination of soil colour, study of soil structure and aggregate analysis, determination of soil moisture, determination of soil moisture constants field capacity; water holding capacity. Study of infiltration rate of soil, determination of pH and Electrical conductivity of soil.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of Lecture
1.	Soil- Pedological and edaphological concepts.	1
2.	Soil forming rocks and minerals and their classification.	2
3.	Weathering: Physical, chemical and biological weathering of rocks	2
4.	Soil formation.	1
5.	Pedogenic processes/soil forming processes.	2
6.	Soil profile.	1
7.	Silicate clays: constitution and properties.	2
8.	Sources of charge.	1
9.	Ion exchange, cation and anion exchange capacity.	1
10.	Soil colloids: inorganic and organic, Properties of soil colloids.	2
11.	Ion exchange in soils.	1
12.	Soil texture.	1
13.	soil structure.	1
14.	Bulk density and particle density.	1
15.	soil consistency.	1
16.	Soil temperature.	2
17.	soil air	1
18.	Soil water	2
19.	Soil organic matter	2
20.	Soil reaction and buffering capacity.	1
21.	Soil taxonomy, keys to soil orders.	2
22.	Soils of India.	1

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Study of general properties of minerals.	1
2.	Study of minerals-silicate and non-silicate minerals.	1
3.	Study of rocks-igneous, sedimentary and metamorphic rocks.	1
4.	Study of a soil profile.	1
5.	Study of collection and processing of soil for analysis.	1
6.	Study of soil texture-feel method and mechanical analysis.	1
7.	Determination of Bulk density of soil sample.	1
8.	Determination of particle density of soil and computation of porosity.	1
9.	Determination of soil colour by munsell colour chart.	1
10.	Study of soil structure and aggregate analysis.	1
11.	Determination of soil moisture by gravimetric method.	1

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12.	Determination soil moisture content at 1/3 bars (field capacity) by pressure plate (membrane) apparatus.	1
13.	Determination of water holding capacity.	1
14.	Measurement of infiltration rate in soil by double ring infiltrometer.	1
15.	Determination of soil reaction (pH) of soil.	1
16.	Determination of electrical conductivity of soil.	1

Suggested Readings:

1. Brady, N. C. and Well, R. R. 2014. Nature and properties of soils. Pearson Education Inc., New Delhi.
2. Chopra, S. L., Kanwar, J. S. and Rakshit, A. 2013. Analytical Agricultural Chemistry, Kalyani Publishers Ludhiana.
3. Das, D. K. 2011. Introductory Soil Science (3rd Edition), Kalyani publisher, Ludhiana (India).
4. Gupta, P. K. 2009. Soil, Plant, Water and Fertilizer Analysis (2nd Edition), Agrobios, Jodhpur (India).
5. Indian Society of Soil Science (ISSS) 2002. Fundamentals of Soil Science, IARI, New Delhi.
6. Mehra, R. K. 2004. Text Book of Soil Science, ICAR, New Delhi.
7. Rakshit, A., Raha, P. and Bhadoria, P. B. S. 2015. Principles of Soil Science. Kalyani Publishers, Ludhiana.
8. Sehgal, J. A. 2005. Textbook of Pedology: Concepts and Applications. Kalyani Publishers, New Delhi.
9. Seema, Sodani R., Yadav S. 2019. Manual for Soil and Plant analysis, LAP Lambert Academic Publishing, U.K.
10. Indian Society of Soil Science (ISSS) 2015. Soil Science: An Introduction, Indian society of soil science, New Delhi.

AGR-106	Fundamentals of Horticulture	3 (2+1)
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Course Status	: Core
Contact Hours (L-T-P)	: 2-0-1
Course Objective	: 1. To provide knowledge on different branches of horticulture viz. pomology, olericulture, floriculture and landscaping, spices and medicinal plants. 2. To provide knowledge on orchard management, propagation methods, cultural operations and nutrient management of horticultural crops. 3. To provide knowledge on different physiological aspects of horticultural crops.
Course Outcomes (CO)	: After the completion of this course the student will be able to learn

CO-1: Importance of horticulture and classification of horticultural crops.

CO-2: Principles and methods of plant propagation.

CO-3: Principles and methods of orchard establishment and management.

Course Description :

Theory:	CO Mapping
Unit 1: Introduction Horticulture: Its different branches, importance and scope, Horticultural and botanical classification, soil and climate for horticultural crops, Introduction to protected cultivation, Introduction to post-harvest management of fruits and vegetables.	CO-1

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Unit 2: Plant propagation Plant propagation: methods and propagation structures, seed dormancy and seed germination, Merits and demerits of sexual and asexual propagation, Stock-scion relationship, Nursery raising and its importance.	CO-2
Unit 3: Orchard establishment and management Principles of orchard establishment, principles and methods of training and pruning of fruit crops, Juvenility and flower bud differentiation, unfruitfulness in horticultural crops, pollination, pollinizers and pollinators, fertilization and parthenocarpy, importance of bio regulators in horticultural crops, irrigation and its methods, Fertilizer application in horticultural crops.	CO-3

Practical:

Identification and nomenclature of fruits, Layout of an orchard, pit making and system of planting, Nursery raising techniques of fruit crops, Understanding of plant propagation structures, Propagation through seeds and plant parts, Propagation techniques for horticultural crops, Container, potting mixture, potting and repotting, Training and pruning methods on fruit crops, Preparation of fertilizer mixture and application, Preparation and application of PGR, Layout of different irrigation systems, Maturity studies, harvesting, grading, packaging and storage.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of Lecture
1.	Horticulture - Its definition and branches.	1
2.	Importance and scope of horticulture.	1
3.	Botanical and Horticultural classification of horticultural crops.	1
4.	Soil and climate for horticultural crops.	1
5.	Introduction to protected cultivation of horticultural crops.	1
6.	Introduction to post-harvest management of fruits and vegetables.	1
7.	Plant propagation methods- sexual propagation.	1
8.	Plant propagation methods- asexual propagation.	1
9.	Asexual propagation methods- cutting.	1
10.	Asexual propagation methods- layering.	1
11.	Asexual propagation methods- budding.	1
12.	Asexual propagation methods- grafting.	1
13.	Asexual propagation methods- specialized structures.	1
14.	Propagation structures.	1
15.	Seed dormancy- types and mechanisms.	1
16.	Seed dormancy- methods of breaking seed dormancy.	1
17.	Merits and demerits of sexual and asexual propagation	1
18.	Stock-scion relationship.	1
19.	Nursery raising and its importance- nursery types and affecting factors.	1
20.	Components of a model nursery.	1
21.	Principles of orchard establishment.	1
22.	Methods of orchard layout.	1
23.	Principles and methods of training and pruning of fruit crops.	1
24.	Juvenility and flower bud differentiation.	1
25.	Unfruitfulness in horticultural crops.	1
26.	Pollination, pollinizers and pollinators.	1
27.	Fertilization and parthenocarpy.	1
28.	Importance of plant bio-regulators in horticultural crops.	1
29.	Irrigation and its methods used in horticultural crops.	1
30.	Fertilizer application in horticultural crops.	1

Practical Schedule:

S. No.	Name of Topic	No. of practical
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1.	Identification and nomenclature of fruits.	1
2.	Identification and brief description of garden tools.	1
3.	Layout of an orchard, pit making and system of planting.	1
4.	Nursery raising techniques of fruit crops.	1
5.	Understanding of plant propagation structures.	1
6.	Propagation of horticultural crops through seeds .	1
7.	Propagation of horticultural crops through specialized plant parts.	1
8.	Propagation techniques for horticultural crops- layering/cutting.	1
9.	Propagation techniques for horticultural crops- budding/grafting.	1
10.	Container, potting mixture, potting and repotting.	1
11.	Practice of training and pruning methods on fruit crops.	1
12.	Preparation of fertilizer mixture and application.	1
13.	Preparation and application of PGR.	1
14.	Layout of different irrigation systems.	1
15.	Studies on maturity, harvesting, grading, packaging and storage of fruits and vegetables.	1

Suggested Readings:

1. Chadha, K.L. 2019. Handbook of Horticulture (2 Vol., 2nd Rev. Edn.). ICAR.
2. Kumar, N. 2021. Introduction to Horticulture (9th Edn.). MedTech Science Publications.
3. R.L.Bhardwaj and D.K.Sarolia, 2011. Modern Nursery Management, Agrobios Publication – Jodhpur
4. Misra, K.K. and Kumar, R. 2014. Fundamentals of Horticulture. Biotech Books.
5. Peter, K.V. 2009. Basic Horticulture. NIPA.
6. Salunkhe, D.K. and Kadam, S.S. 2013. A Handbook of Fruit Science and Technology. CRC Press.
7. Singh, Jitendra. 2020. Basic Horticulture. Kalyani Publications.

AGRSEC-101 Mushroom Production Technology 2 (0+2)

Course Status	: Skill Enhancement Course
Contact Hours (L-T-P)	: 0-0-4
Course Objective	: To develop analytical and entrepreneurial skills in students and turned them into mushroom entrepreneur.
Course Outcomes (CO)	: After the completion of this course, the student will be able to - CO-1: acquaint about the status, scope and importance of mushrooms in the state of Rajasthan. CO-2: produce spawn and mushrooms at large scale. CO-3: know about value added products of mushroom and economics/ marketing of mushroom and its products.

Course Description :

Practical:	CO Mapping
Unit 1: Introduction to mushroom cultivation in India and Rajasthan Current status and scope of mushroom cultivation in India and Rajasthan. Important features of edible fungi. Nutritional and medicinal value of mushrooms. Collection of wild mushroom flora of Rajasthan.	CO-1
Unit 2: Spawn production technology Preparation of media. Tissue culture preparation. Sub-culturing for culture maintenance and its preservation. Spawn preparation techniques.	

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Unit 3: Mushroom production technology Mushroom farm design and infrastructure required for the commercial unit. Raw material formulations for Button mushroom (<i>Agaricus bisporus</i>). Composting (long method and short method). Casing preparation. Cultivation techniques of: Dhingri mushroom (<i>Pleurotus florida</i>), Shiitake mushroom (<i>Lentunus edodes</i>), Milky mushroom (<i>Calocybe indica</i>), Paddy straw mushroom (<i>Volvariella volvacea</i>). Crop management practices. Mushroom diseases and their control.	CO-2
Unit 4: Value added products and marketing Preparation of value-added products from mushrooms. Economics of mushrooms. Marketing of mushrooms. Exposure visits to commercial farms.	CO-3

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Current status and scope of mushroom cultivation in India and Rajasthan.	1
2.	Important features of edible fungi.	1
3.	Nutritional and medicinal value of mushrooms	1
4.	Collection of wild mushroom flora of Rajasthan.	1
5.	Preparation of media.	1

6.	Tissue culture preparation.	1
7.	Sub-culturing for culture maintenance and its preservation.	1
8.	Spawn preparation techniques.	2
9.	Mushroom farm design and infrastructure required for the commercial unit.	2
10.	Raw material formulations for Button mushroom (<i>Agaricus bisporus</i>).	1
11.	Composting (long method and short method).	2
12.	Casing preparation.	2
13.	Cultivation technique of Dhingri mushroom (<i>Pleurotus florida</i>),	2
14.	Cultivation technique of Shiitake mushroom (<i>Lentunus edodes</i>),	2
15.	Cultivation technique of Milky mushroom (<i>Calocybe indica</i>),	2
16.	Cultivation technique of Paddy straw mushroom (<i>Volvariella volvacea</i>).	2
17.	Crop management practices.	1
18.	Mushroom diseases and their control.	1
19.	Preparation of value-added products from mushrooms.	2
20.	Economics of mushrooms.	1
21.	Marketing of mushrooms.	1
22.	Exposure visits to commercial farms.	2

Suggested Readings:

1. Singh, M., Vijay, B., Kamal, S., Wakchaure, G.C. (2011). Mushrooms: cultivation, marketing and consumption. Directorate of Mushroom Research. ICAR-Chambaghat, Solan –173213 (HP).
2. A textbook on mushroom cultivation: Theory and Practice, Aggarwal, A., Sharma, Y. P. and Jangra, E., Newrays Publishing House.
3. Mushroom Cultivation, Tripathi, D.P. (2005) , Oxford & IBH Publishing Co. Pvt.Ltd., New Delhi.
4. Mushroom cultivation technology, Acharya, K., Roy, A. and Sarkar, J., Techno world, Kolkata.
5. Mushroom production and processing thechnology (2010), Pathak Yadav Gour, Agrobios (India).
6. Upadhyay, R.C., Singh, S.K., and Tewari, R.P. (2004). Mushroom spawn production and infrastructure requirements. Technical Bulletin, DMR, Solan.






Course Status : Skill Enhancement Course

Contact Hours (L-T-P) : 0-0-4

Course Objective : To develop entrepreneurial skills of students in Vermicompost Production.

Course Outcomes (CO) : After the completion of this course, the student will be able to -
CO-1: know the scope and importance of Vermicompost Production.
CO-2: know about the vermicompost production economics/ marketing of its.

Course Description :

Practical:	CO Mapping
Unit 1: Introduction to Vermicompost Vermicompost: Introduction, Definition and objectives of vermi-technology. Importance of vermicomposting in utilization of Agriculture waste and organic recycling of nutrients.	CO-1
Unit 2: Method of preparation of vermicompost Classification of earthworm's. Method of preparation of vermicompost. Method and doses of vermicompost application for cereals, vegetables, tress and pots. Role of vermicomposting in organic farming and soil fertility. Identification of earthworms. Preparation of vermicompost. Separation and procurement of vermiculture and vermicompost.	CO-2
Unit 3: Quality Analysis for standards of vermicompost Analysis for quality standards and fractionation of vermicompost- Microbial viability, C:N ratio, Moisture, Organic Carbon, Nitrogen, Phosphorus, Potassium and Micronutrient. Drawing of flow-sheet chart and preparation of vermicompost project.	

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Vermicompost: Introduction, Definition and objectives of vermitechology.	1
2.	Importance of vermicompost in utilization of Agriculture waste, and organic recycling of nutrients.	2
3.	Classification of earth worms.	1
4.	Method of preparation of vermicompost.	1
5.	Method and doses of vermicompost application for cereals, pulses, trees vegetables and pots.	2
6.	Role of vermicomposting in organic farming and soil fertility.	2
7.	Identification of earthworms.	1
8.	Collection and preparation of bedding materials.	2
9.	Preparation of beds for vermicompost and inoculation of vermiculture.	2
10.	Separation of vermiculture and vermicompost.	2
11.	Maintenance of vermiculture.	1
12.	Preservation and packing of vermicompost.	2
13.	Determination of quality standards of vermicompost (Microbial viability, C:N ratio, Moisture, Organic Carbon, Nitrogen, Phosphorus, Potassium and Micronutrient).	10
14.	Fractionation of vermicompost.	2
15.	Preparation of project for vermicomposting.	1

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Suggested Readings:

1. Bhatnagar, R.K. and Palta, R.K. (2002). Vermiculture and vermicomposting. Kalyani Publishers, Ludhiana.
2. Clive A. Edwards, Norman Q. Arancon, and Rhonda L. Sherman (2011). Vermiculture Technology: Earthworms, Organic Wastes, and Environmental Management". CRC Press. ISBN: 9781439809877
3. Insam H., Franke-Whittle I., Goberna M (2010). Microbes at Work: From Wastes to Resources, Springer-Verlag. ISBN: 9783642112039
4. Anshu B. Gupta (2018). Vermicompost: Practices in India. Publisher: Astral International, ISBN: 9789386652991
5. Dr. M. Gunasekaran (2021). "Vermiculture Biotechnology: An Option for Organic Waste Management" Scientific Publishers (India), ISBN: 9788172339281
6. Dr. Arun K. Sharma (2020), Vermicomposting for Sustainable Agriculture, New India Publishing Agency, ISBN: 9789385516812.

NSS-101		National Service Scheme -I	1 (0+1)
Course Status	:	Common Course	
Contact Hours (L-T-P)	:	0-0-4	
Course Objective	:	To create a generation of well-informed, responsible citizens who are committed to contributing to the betterment of society through active engagement, volunteerism, and social mobilization.	
Course Outcomes (CO)	:	After the completion of this course, the student will be able to - CO-1: Understand about NSS, its organizational structure and the significance of its symbols and badges. CO-2: analyze and guide financial patterns of NSS schemes and effectively maintain activity diaries. CO-3: understand the various definitions, profiles, and challenges faced by youth, recognizing their potential as agents of social change and exploring opportunities available through youth programs. CO-4: develop skills in mapping community stakeholders, crafting culturally relevant messages, and utilizing effective methods for youth-adult partnership in mobilization efforts. CO-5: to instill a sense of national identity by exploring the role of youth in nation-building, along with strategies for conflict resolution and peace-building within diverse communities. CO-6: explore the significance of volunteerism and shramdan in Indian tradition. CO-7: gain knowledge about the Constitution of India, including fundamental rights and duties, human rights, and consumer awareness, enhancing their sense of citizenship. CO-8: analyze the concept of family, community structures like Panchayati Raj Institutions (PRIs), and their roles in societal development.	



Course Description :

Practical:	CO Mapping
Unit-I: Introduction and organizational Structure of NSS: Introduction and basic components of NSS: Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS. Organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health.	CO-1
Unit-II: NSS programmes and activities: Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary.	CO-2
Unit-III: Understanding Youth: Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change.	CO-3
Unit-IV: Community mobilization: Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership; Social harmony and national integration.	CO-4
Unit-V: Social Harmony and National Integration: Indian history and culture, role of youth in nation building, conflict resolution and peace-building.	CO-5
Unit-VI: Volunteerism and shramdan: Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism.	CO-6
Unit-VII: Citizenship, constitution and human rights: Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights to information.	CO-7
Unit-VIII: Family and society: Concept of family, community (PRIs another community based organizations) and society.	CO-8



SEMESTER-II

AGR-201	Personality Development	2 (1+1)
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Course Status	: Common Course
Contact Hours (L-T-P)	: 1-0-2
Course Objective	: Tto introduce the students about personality development by realizing their potential, strengths, cultivate their inter-personal skills and improve employability.
Course Outcomes (CO)	: After the completion of this course, the student will be able to - CO-1: Understand personality and analyze personality shaping factors. CO-2: Understand behaviors and evaluate their impact on organizational behavior. CO-3: Explore learning and intelligence and their role in individual and group performance. CO-4: Apply motivation to enhance teamwork, group dynamics, and conflict management.

Course Description :

Theory:	CO Mapping
Unit 1: Personality 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.	CO-1
Unit 2: Behaviour 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 and factors affecting perception, Attribution theory and case studies on Perception and Attribution.	CO-2
Unit 3: Learning and Intelligence	CO-3

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.	
Unit 4: Motivation Motivation- theories and principles, Teamwork and group dynamics.	CO-4

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.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of lecture
1.	Personality Definition, Nature of personality, theories of personality and its types.	2
2.	The humanistic approach - Maslow's self-actualization theory, shaping of personality, determinants of personality, Myers-Briggs Typology Indicator, Locus of control and performance.	2



3.	Type A and Type B Behaviours, personality and Organizational Behaviour. Foundations of individual behavior and factors influencing individual behaviour.	2
4.	Models of individual behavior, Perception and attributes and factors affecting perception, Attribution theory and case studies on Perception and Attribution.	2
5.	Learning: Meaning and definition, theories and principles of learning,	1
6.	Learning and organizational behavior, Learning and training, learning feedback. Attitude and values.	2
7.	Intelligence- types of Intelligence, theories of intelligence, measurements of intelligence, factors influencing intelligence.	2
8.	Intelligence and Organizational behavior, emotional intelligence.	1
9.	Motivation- theories and principles, Teamwork and group dynamics.	2

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	MBTI personality analysis.	2
2.	Learning Styles and Strategies.	2
3.	Motivational needs	1
4.	Firo-B	1
5.	Interpersonal Communication.	1
6.	Teamwork and team building.	2
7.	Group Dynamics.	1
8.	Win-win game.	1
9.	Conflict Management.	2
10.	Leadership styles.	1
11.	Case studies on Personality and Organizational Behavior.	2

Suggested Readings:

1. Andrews, Sudhir. How to Succeed at Interviews.
2. Heller, Robert. Effective Leadership. Essential Manager series.
3. Hindle, Tim. Reducing Stress. Essential Manager series.
4. Kumar, Pravesh. All about Self- Motivation.
5. Lucas, Stephen. Art of Public Speaking.
6. Mile, D.J. Power of Positive Thinking.
7. Smith, B. Body Language.
8. Shaffer, D. R. Social and Personality Development (6th Edition).

AGR-202	Environmental Studies and Disaster Management	3 (2+1)
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Course Status	: Common Course
Contact Hours (L-T-P)	: 2-0-1
Course Objective	: 1. To develop an understanding of the natural environment, its components, and processes. 2. To foster awareness about current environmental issues such as pollution, climate change, biodiversity loss, deforestation, and resource depletion. Encourage responsible behavior and sustainable practices to mitigate environmental problems. 3. To familiarize students with national and international policies, treaties, and legal frameworks related to environmental protection and disaster management. Highlight the role of government, non-governmental organizations (NGOs), and international agencies in these domains Train students to analyze complex environmental

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- and disaster-related challenges
4. To instil a sense of ethical responsibility towards the environment and society.
 5. To encourage participation in community-based initiatives for environmental conservation and disaster risk reduction

Course Outcomes (CO) : After the completion of this course, the student will be able to-

CO-1: Introduction to basic concepts of Environment.

CO-2: Basics of Ecosystem and environmental pollution along with various laws of environment protection.

CO-3: Understanding the disaster, its types and management.

Course Description :

Theory:	CO Mapping
Unit 1: Introduction 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. 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.	CO-1
Unit 2: Ecosystems Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem. Types of ecosystem. Biodiversity and its conservation: Introduction, definition, types. Biogeographical classification of India. Importance and Value of biodiversity. Biodiversity hot spots. 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. h. 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.	CO-2

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Unit 3: 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.	CO-3
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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 ecosystem – Visit to pond/river/hills. Visit to areas affected by natural disaster.

Theory Lecture Schedule

S. No.	Name of Topic	No. of lecture
1.	Introduction to Environment - Environmental studies - Definition, scope and importance - Multidisciplinary nature of environmental studies - Segments of Environment	1
2.	Spheres of Earth - Lithosphere - Hydrosphere - Atmosphere - Different layers of atmosphere.	1
3.	Natural Resources: Classification - Forest resources. Water resources. Mineral resources Food resources. Energy resources. Land resources. Soil resources.	1
4.	Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem. Types of ecosystem.	1
5.	Biodiversity and its conservation: Introduction, definition, types	1
6.	Biogeographical classification of India. Importance and Value of biodiversity. Biodiversity hot spots.	2
7.	Threats and Conservation of biodiversity	1
8.	Environmental Pollution: Definition	1
9.	Cause, effects and control measures of: a. Air pollution	1
10.	Cause, effects and control measures of: b. Water pollution	1
11.	Cause, effects and control measures of : c. Soil pollution	1
12.	Cause, effects and control measures of : e. Noise pollution.	1
13.	Cause, effects and control measures of : d. Marine pollution.	1
14.	Cause, effects and control measures of : f. Thermal pollution. h. light pollution.	1
15.	Solid Waste Management: Classification of solid wastes and management methods	1
16.	Composting, Incineration, Pyrolysis, Biogas production	1
17.	Causes, effects and control measures of urban and industrial wastes.	1
18.	Social issues and the Environment:	1
19.	Urban problems related to energy.	1
20.	Water conservation, rain water harvesting, watershed management.	1

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21.	Environmental ethics: Issues and possible solutions,	1
22.	Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.	1
23.	Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act Forest Conservation 1Act.	2
24.	Human Population and the Environment: Environment and human health: Human Rights, Value Education. Women and Child Welfare.	1
25.	Role of Information Technology in Environment and human health.	1
26.	Disaster management :Natural Disasters - Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves.	2
27.	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	1
28.	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.	1
29.	Central, state, district and local administration in disaster control; Armed forces in disaster response; Police and other organizations in disaster management.	1

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain.	2
2.	Energy: Biogas production from organic wastes. Environmental sampling and preservation.	1
3.	Visit to wind mill / hydro power / solar power generation units.	1
4.	Biodiversity assessment in farming system.	1
5.	Floral and faunal diversity assessment in polluted and un polluted system.	1
6.	Visit to local polluted site - Urban/ Rural/ Industrial/ Agricultural to study of common plants, insects and birds.	2
7.	Water quality analysis: pH, EC and TDS.	1
8.	Estimation of Acidity, Alkalinity. Estimation of water hardness.	1
9.	Estimation of DO and BOD in water samples.	1
10.	Estimation of COD in water samples.	1
11.	Enumeration of <i>E. coli</i> in water sample.	1
12.	Assessment of Suspended Particulate Matter (SPM).	1
13.	Study of simple ecosystem – Visit to pond/ river/ hills.	1
14.	Visit to areas affected by natural disaster.	1

Suggested Readings:

1. De, A.K. 2010. Environmental chemistry. Published by New Age International Publishers, New Delhi. ISBN:13-978 81 224 2617 5. 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), Bangalore. 36 pp.
3. Erach Bharucha, Text book for Environmental studies. University Grants Commission, New Delhi
4. Parthiban, K.T., Vennila, S., Prasanthrajan, M. Umesh and Kanna, S. 2023. Forest, Environment, Biodiversity and Sustainable development. Narendra Publishing House, New Delhi.

5. Prasanthrajan, M. and Mahendran, P.P. 2008. A text book on Ecology and Environmental Science. ISBN 81-8321-104-6. Agrotech Publishing Academy, Udaipur
6. Sharma, P.D. 2009. Ecology and Environment, Rastogi Publications, Meerat, India
7. Tyler Miller and Scot Spoolman. 2009. Living in the Environment (Concepts, Connections, and Solutions). Brooks/cole, Cengage learning publication, Belmont, USA

AGR-203

Soil Fertility Management

3 (2+1)

Course Status : Core

Contact Hours (L-T-P) : 2-0-2

Course Objective : To provide a comprehensive knowledge of soil fertility, plant nutrition, fertilizers, and nutrient management.

Course Outcomes (CO) : After the completion of this course, the student will be able to-

CO-1: Develop knowledge of soil fertility, plant nutrition, nutrient transport, and the chemistry of nutrients. Identify the roles, deficiencies, and toxicities of essential nutrients.

CO-2: Gain expertise in evaluating soil fertility, soil testing, plant analysis, and rapid tissue tests. Understand critical nutrient levels and forms in soil.

CO-3: Learn about manures, fertilizers, and nutrient management approaches. Study fertilizer classification, composition, properties, and methods to improve nutrient use efficiency.

Course Description :

Theory:	CO Mapping
Unit 1: Introduction to Soil Fertility and Plant Nutrition History of soil fertility and plant nutrition. criteria of essentiality. Forms of nutrients in soil. 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 micronutrients.	CO-1
Unit 2: Soil fertility evaluation Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. plant analysis, rapid plant tissue tests. Indicator plants.	
Unit 3: Manures, fertilizer and Soil amendments Introduction and importance of manures and fertilizers. Preparation and properties of major manures (FYM, Compost, Vermicompost, Green manuring, Oilcakes. Chemical fertilizers: classification, composition and properties of major fertilizers, secondary and micronutrient fertilizers, Complex fertilizers, Customised fertilizers, water soluble fertilizers nano fertilizers. Soil amendments, Fertilizer Storage, Fertilizer Control Order.	CO-2
Unit 4 Fertilizer recommendation, Carbon sequestration and Carbon Trading Fertilizer recommendation approaches. Integrated nutrient management. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated	CO-3

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conditions. STCR/RTNM/ IPNS, Carbon sequestration and Carbon Trading.	
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Practical:

Introduction of analytical instruments and their principles, calibration and applications of Coloremety 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.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of lecture
1.	History of soil fertility and plant nutrition	1
2.	Criteria of essentiality. Forms of nutrients in soil	1
3.	Role, deficiency and toxicity symptoms of essential plant nutrients	2
4.	Mechanisms of nutrient transport to plants	1
5.	Factors affecting nutrient availability to plants	1
6.	Chemistry of macro and micronutrients	1
7.	Soil fertility evaluation; Soil testing, critical levels of different nutrients in soil	2
8.	Plant analysis, rapid plant tissue tests. Indicator plants	1
9.	Introduction and importance of manures and fertilizers.	1
10.	Preparation and properties of major manures (FYM, Compost, Vermicompost, Green manuring, Oilcakes.	3
11.	Chemical fertilizers: classification, composition and properties of major fertilizers, secondary and micronutrient fertilizers, Complex fertilizers, Customised fertilisers, water soluble fertilizers nano fertilizers	4
12.	Soil amendments	2
13.	Fertilizer Storage, Fertilizer Control Order	1
14.	Factor influencing nutrient use efficiency (NUE) methods of application under rainfed and irrigated conditions.	2
15.	Fertilizer recommendation approaches	1
16.	Integrated nutrient management	1
17.	Methods of fertilizer recommendations to crops	1
18.	Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions	2
19.	STCR/RTNM/IPNS.	2
20.	Carbon sequestration and Carbon Trading,	2

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Introduction of analytical instruments and their principles, calibration and applications of Coloremety and flame photometry	2
2.	Estimation of alkaline hydrolysable N in soils	1
3.	Estimation of soil extractable P in soils	1
4.	Estimation of exchangeable K in soils	1
5.	Estimation of exchangeable Ca in soils	1
6.	Estimation of exchangeable Mg in soils	1
7.	Estimation of soil extractable S in soils	1
8.	Estimation of DTPA extractable Zn in soils	2
9.	Estimation of N in plants	1
10.	Estimation of P in plants	1
11.	Estimation of K in plants	1
12.	Estimation of S in plants	1

13.	Study of characters of orders Diptera and its families	1
14.	Sampling techniques for estimation of insect population and damage	1

Suggested Readings:

1. Soil Fertility and Nutrient Management – By S. S. Singh, Kalyani Publishers
2. Soil Fertility and Fertilizers – By Samuel L. Tisdale, Werner L. Nelson and James D. Beaton, Macmillan Publishing Company, New York
3. Brady, N. C. and Well, R. R. 2014. Nature and properties of soils. Pearson Education Inc., New Delhi.
4. Chopra, S. L., Kanwar, J. S. and Rakshit, A. 2013. Analytical Agricultural Chemistry, Kalyani Publishers Ludhiana.
5. Das, D. K. 2011. Introductory Soil Science (3rd Edition), Kalyani publisher, Ludhiana (India).
6. Gupta, P. K. 2009. Soil, Plant, Water and Fertilizer Analysis (2nd Edition), Agrobios, Jodhpur (India).
7. Indian Society of Soil Science (ISSS) 2002. Fundamentals of Soil Science, IARI, New Delhi.
8. Seema, Sodani R., Yadav S. 2019. Annual For Soil and plant analysis, LAP Lambert Academic Publishing, U.K.

AGR-204	Fundamentals of Entomology	3 (2+1)
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Course Status : Core

Contact Hours (L-T-P) : 2-0-1

Course Objective :

1. To know the history of entomology, classification of insects and their relationship with other arthropods.
2. To study the various morphological characters of class insect and their importance for classification of insects.
3. To get an idea about the different physiological systems of insects and their roles in growth and development and communications of insects.
4. To study the characteristics of commonly observed insect orders and their economically important families.

Course Outcomes (CO) : After the completion of this course, the student will be able to-

CO-1: Learn about phylum arthropoda.

CO-2: Understand morphology and anatomy of insect.

CO-3: Comprehend effect and functions of various biotic and abiotic factors.

CO-4: Identify agriculturally important insect's orders and families.

Course Description :

Theory:	CO Mapping
Unit 1: Introduction 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.	CO-1



Unit 2: Insect Morphology and Anatomy Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system in insects. Types of reproduction in insects. Major sensory organs.	CO-2
Unit 3: Ecology	CO-3
Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors and biotic factors. Categories of pests.	
Unit 4: Systematics 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 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, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae. Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.	CO-4

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. Sampling techniques for estimation of insect population and damage.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of lecture
1.	History of Entomology in India	1
2.	Major points related to dominance of Insecta in Animal kingdom	1
3.	Classification of phylum Arthropoda upto classes, Relationship of class Insecta with other classes of Arthropoda	1
4.	Morphology: Structure and functions of insect cuticle and molting	1
5.	Body segmentation. Structure of head, thorax and abdomen	1
6.	Structure and modifications of insect antennae	1
7.	Structure and modifications of insect mouth parts	1
8.	Structure and modifications of insect legs	1
9.	Wing venation, modifications and wing coupling apparatus	1
10.	Metamorphosis and diapause in insects	1
11.	Types of larvae and pupae	1
12.	Structure and functions of digestive system in insects	1
13.	Structure and functions of circulatory system in insects	1
14.	Structure and functions of excretory system in insects	1
15.	Structure and functions of respiratory system in insects	1

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16.	Structure and functions of nervous system in insects	1
17.	Structure and functions of secretory (endocrine) system in insects	1
18.	Structure and functions of reproductive system in insects	1
19.	Types of reproduction in insects	1
20.	Major sensory organs	1
21.	Insect Ecology: Introduction, environment and its components	1
22.	Effect of abiotic factors–temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents	1
23.	Effect of biotic factors – food competition, natural and environmental resistance, agro-ecosystem, categories of pests	1
24.	Systematics: Taxonomy –importance, history and development and binomial nomenclature	
25.	Definitions of Biotype, sub-species, species, genus, family and order	1
26.	Orthoptera: Acrididae, Tettigoniidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae;	1
27.	Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae	1
28.	Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae;	1
29.	Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae;	1
30.	Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae;	1
31.	Hymenoptera: Tenthredinidae, Apidae. Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae;	1
32.	Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.	1

Practical Schedule:

. No.	Name of Topic	No. of practical
1.	Methods of collection and preservation of insects including immature stages	2
2.	External features of Grasshopper/Blister beetle	1
3.	Types of insect antennae, mouthparts and legs	2
4.	Wing venation, types of wings and wing coupling apparatus,	1
5.	Types of insect larvae and pupae	1
6.	Dissection of digestive system in insects (Grasshopper)	1
7.	Study of characters of orders Orthoptera, Dictyoptera and their families	1
8.	Study of characters of orders Odonata, Isoptera, Thysanoptera and their families	1
9.	Study of characters of orders Hemiptera and its families	1
10.	Study of characters of orders Neuroptera, Lepidoptera and its families	1
11.	Study of characters of orders Coleoptera and its families	1
12.	Study of characters of orders Hymenoptera and its families	1
13.	Study of characters of orders Diptera and its families	1
14.	Sampling techniques for estimation of insect population and damage	1

Suggested Readings:

1. Fundamentals of Ecology - Eugene. P. Odum and Gray W. Barrett
2. Imm's General Text book of Entomology— O.W. Rechards and R.G. Davies
3. Introduction to the study of Insects –D. J. Borror and DeLong's

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4. The Insects: Structure and Function -Chapman, R. F.
5. Principles of Insect Morphology Snodgrass, R. E.

AGR-205	Livestock and Poultry Management	2 (1+1)
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Course Status : Core

Contact Hours (L-T-P) : 1-0-2

Course Objective : 1. Provide basic knowledge to the students about scientific livestock and poultry rearing practices
2. Entrepreneurship development through Livestock/poultry and Agriculture Integrated Farming System.

Course Outcomes (CO) : After the completion of this course, the student will be able to learn about -
CO-1: Importance of livestock and poultry management.
CO-2: Breeds and breeding management of animals and poultry.
CO-3: Nutritional practices of animals and poultry.
CO-4: Health management practices of animals and poultry.

Course Description :

Theory:	CO Mapping
Unit 1: Outline of Animal husbandry Role of livestock in national economy, Reproduction in farm animals and their improvement, Reproduction in poultry and their improvement, Housing principles, space requirements for different species of livestock & poultry.	CO-1
Unit 2: Breed and Breeding Management Management of calf, Heifer and milch animals, Management of Sheep & Goats including their breeds, Management of Swine including of breeds, Breeds of dairy animals (Indigenous & Exotic), Breeds of poultry (Indigenous & Exotic), Incubation, Hatching & Brooding of chicks	CO-2
Unit 3: Animal Nutrition Management Proximate principles of feed, Nutrient and their functions, Classification of feed stuffs including Feed supplements & Feed additives and feed ingredients for ration, Feeding and digestion of livestock & poultry.	CO-3
Unit 4: Animal Health Management Important of livestock diseases and their and control, important diseases of poultry and their control, Prevention measurement of disease management of both livestock & poultry	CO-4

Practical:

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipment. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production

Theory Lecture Schedule:

S. No.	Name of topic	No. of lecture
1.	Role of livestock in national economy.	1
2.	Reproduction in farm animals and their improvement.	1
3.	Reproduction in poultry and their improvement	1
4.	Housing principles, space requirements for different species of livestock & poultry.	1



5.	Management of calf, Heifer and milch animals.	1
6.	Management of Sheep & Goats including their breeds.	1
7.	Management of Swine including of breeds.	1
8.	Breeds of dairy animals (Indigenous & Exotic).	1
9.	Breeds of poultry (Indigenous & Exotic).	1
10.	Incubation, Hatching & Brooding of chicks.	1
11.	Proximate principles of feed, Nutrient and their functions.	1
12.	Classification of feed stuffs including Feed supplements & Feed additives and feed ingredients for ration.	1
13.	Feeding and digestion of livestock & poultry.	1
14.	Important of livestock diseases and their and control.	1
15.	important diseases of poultry and their control.	1
16.	Prevention measurement of disease management of both livestock & poultry.	1

Practical Schedule:

S. No.	Name of topic	No. of practical
1.	External body parts of cattle, Buffalo and Goat.	1
2.	External body parts of swine & poultry.	1
3.	Handling and restraining of livestock.	1
4.	Identification methods of farm animals and poultry.	1
5.	Daily routine farm operation and farm records.	1
6.	Judging of cattle, Goat and poultry.	1
7.	Culling of livestock and poultry.	1
8.	Planning and layout of housing for different species of livestock & poultry	1
9.	Computation of ration for livestock.	2
10.	Formulation of concentrate mixtures.	1
11.	Milking methods & Clean milk production.	1
12.	Incubation, hatchery operation & equipments.	1
13.	Management of chick, grower and layers.	1
14.	Debeaking, Dusting and Vaccination.	1
15.	Economics of and livestock and poultry production.	1

Suggested Readings:

1. Banerjee, G. C. 2011. A Text Book of Animal Husbandry. VIII ed. Oxford and IBH Publications. New Delhi.
2. Choudhary, J. L. and Gupta L. 2016. A Text Book of Animal Husbandry. Somani Publication
3. D. N. Verma, A text Book of Livestock Production management in Tropic
4. Devendra, C. and Mecleroy, G. B. 1982. Goat and Sheep Production in Tropics.
5. Dimri, U., Sharma, M. C. and Tiwari, R. 2013. Swine Production and Health Management. New India Pub Agency.
6. Sastry, N. S. R. and Thomas, C. K. 2006. Livestock Production and Management. Kalyani
7. Singh, R. A. 1996. Poultry Production. 3rd ed. Kalyani Publications. New Delhi.
8. Thomas, C. K., Sastry, N. S. R. and Singh, R. A. 1982. Farm Animal Management and Poultry Production. Vikas Publications. New Delhi.

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Course Status : Core Course

Contact Hours (L-T-P) : 2-0-2

Course Objective :

1. To get acquainted with the role of different microorganisms in the development of plant disease.
2. To get general concepts and classification of plant diseases.
3. To get knowledge of general characteristics of fungi, bacteria, viruses, and other microorganisms causing plant diseases.
4. To acquaint the students with reproduction in fungi, and bacteria, causing plant diseases.
5. To get acquainted with various plant disease management principles and practices

Course Outcomes (CO) :

After the completion of this course, the student will be able to –

CO-1: gain a clear understanding of the concept of disease in plants and the terminology commonly used in plant pathology.

CO-2: acquainted with the role of different microorganisms in the development of plant disease.

CO-3: understand the principles and practices of plant disease management including chemical, cultural, biological, and host resistance methods

Course Description :

Theory:	CO Mapping
Unit 1: Introduction – Introduction to Plant Pathology: Concept of disease in plants; Different terms used in Plant Pathology, History of Plant Pathology with special references to India	CO-1
Unit 2: Causes and Disease Development- Causes of plant disease: Inanimate and animate causes; Classification of plant disease; Parasitism and pathogenesis; Development of disease in plants: Disease Triangle, Disease cycle	CO-2
Unit 3: Overview of Plant Pathogens- Fungi and their morphology, reproduction, and classification of fungi; Bacteria: Morphology, reproduction classification of phytopathogenic bacteria; Other plant pathogens: Mollicutes; Flagellant protozoa; FVB; Green algae and parasitic higher plants; Viruses and viroids, virus transmission.	
Unit 4: Plant Disease Management- Principles of Plant disease management: Disease management with chemicals, Host resistance, cultural and biological method of Integrated Disease Management (IDM).	CO-3

Practical:

Study of the microscope; Acquaintance with laboratory material and equipment; Study of different plant disease symptoms; Microscopic examination of general structure of fungi; Simple staining of bacteria: Direct and indirect staining, Gram staining of bacteria; Microscopic examination of fungal diseased specimen; Microscopic examination of bacterial diseased specimen; Preparation of culture media; Isolation of plant pathogens: Fungi, bacteria and viruses; Purification of plant pathogens; Study on plant disease diagnosis: Koch's Postulates, Characteristics, formulation, methods of application and calculation on fungicides.

Theory Lecture Schedule:

S. No.	Name of Topic	No. of lecture
1.	Introduction to Plant Pathology: Concept of disease in plants.	1
2.	Different terms used in Plant Pathology.	2
3.	History of Plant Pathology with special references to India.	1
4.	Causes of plant disease: Inanimate and animate causes.	1
5.	Classification of plant disease.	2



6.	Parasitism and pathogenesis.	1
7.	Development of disease in plants.	1
8.	Disease Triangle, Disease cycle.	2
9.	Fungi and their morphology, reproduction and classification of fungi.	3
10.	Bacteria: Morphology, reproduction classification of phytopathogenic bacteria.	2
11.	Other plant pathogens: Mollicutes; Flagellant protozoa; FVB.	2
12.	Green algae and parasitic higher plants.	1
13.	Viruses and viroids, virus transmission.	3
14.	Principles of Plant disease management.	2
15.	Disease management with chemicals.	2
16.	Disease management through Host resistance.	2
17.	Disease management by cultural methods.	2
18.	Disease management by biological method.	2

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Study of the microscope.	1
2.	Acquaintance with laboratory material and equipment.	1
3.	Study of different plant disease symptoms.	1
4.	Microscopic examination of general structure of fungi.	1
5.	Simple staining of bacteria, Direct and indirect staining.	1
6.	Gram staining of bacteria.	1
7.	Microscopic examination of fungal diseased specimen.	1
8.	Microscopic examination of bacterial diseased specimen.	1
9.	Preparation of culture media.	1
10.	Isolation of plant pathogenic Fungi.	1
11.	Isolation of plant pathogenic bacteria.	1
12.	Transmission of plant viruses.	1
13.	Purification of plant pathogens	1
14.	Study on plant disease diagnosis: Koch's Postulates.	1
15.	Characteristics and formulation of fungicides.	1
16.	Methods of application and calculation of fungicides.	1

Suggested Readings:

1. Agrios, G.N. 2010. Plant Pathology. Acad. Press.
2. Alexopoulos, Mims and Blackwell. Introductory Mycology.
3. Dhingra, O.D. and Sinclair, J.B. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
4. Gibbs, A. and Harrison, B. 1976. Plant Virology - The Principles. Edward Arnold, London
5. Goto, M. 1990. Fundamentals of Plant Bacteriology. Academic Press, New York.
6. Hull R. 2002. Mathew's Plant Virology. 4th edn. Academic Press, New York.
7. Kamat, M. N. Introductory Plant Pathology. Prakash Pub, Jaipur.
8. Mehrotra, R.S. and Aggarwal, A. 2007. Plant Pathology. 7th edn. Tata Mc Graw Hill Publ. Co. Ltd.
9. Nene, Y.L. and Thapliyal, P.N. 1993. Fungicides in Plant Disease Control. 3rd Ed. Oxford & IBH, New Delhi.
10. Pathak, V. N. Essentials of Plant Pathology. Prakash Pub., Jaipur
11. Rajeev, K. and Mukherjee, R.C. 1996. Role of Plant Quarantine in IPM. Aditya Books.
12. Rhowar, G.G. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd edn. Vol. II. (Ed. David Pimental). CRC Press.
13. Singh R.S. 2008. Plant Diseases. 8 th Ed. Oxford & IBH. Pub. Co.
14. Singh R.S. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Pub. Co.
15. Verma, J.P. 1998. The Bacteria. Malhotra Publ. House, New Delhi.
16. Vyas S. C. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.



Course Status	: SEC (Skill Enhancement Course)
Contact Hours (L-T-P) :	0-0-4
Course Objective	: This course intends to provide a basic knowledge about beneficial Insect and their management.
Course Outcomes (CO)	: After the completion of this course, the student will be able to - CO-1: Rear and management beehives for bee products. CO-2: Cultivate mulberry and rear the silkworm for silk production. CO-3: Inoculate lac insect and commercial production of lac. CO-4: Mass produce natural enemies and identify various other beneficial insects.

Course Description :

Practical:	CO Mapping
Unit 1: Introduction and Apiculture Importance and scope of beneficial insects, types of beneficial insects. Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication.	CO-1
Unit 2: Sericulture Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing techniques of silkworm and Pest and diseases of silkworm.	CO-2
Unit 3: Lac culture Species of lac insect, host plant identification. Lac cultivation and lac production – seed lac, button lac, shellac, lac- products. Natural enemies of lac and their management.	CO-3
Unit 4: Seed Testing: Seed sampling methods, physical purity test, moisture determination, germination test, seed and seedling vigour test, seed viability test, genetic purity test: grow out test, seed health testing using blotter method seed health testing agar plate method.	CO-4
Unit 5: Other beneficial insects Identification of major parasitoids and predators commonly being used in biological control; Insect orders bearing predators and parasitoids used in pest management; Identification and techniques for mass multiplication of natural enemies. Important species of pollinator, weed killers and scavengers with their importance. Entomophagy, and medicinal uses of insects. Insects of forensic importance and insects in waste management.	CO-5

Practical Schedule:

S. No.	Name of Topic	No. of practical
1.	Importance and scope of beneficial insects, types of beneficial insects. Honey bee species, castes of bees.	4
2.	Beekeeping appliances and seasonal management, bee enemies and disease.	3
3.	Bee pasturage, bee foraging and communication.	2
4.	Types of silkworm, voltinism and biology of silkworm.	2
5.	Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.	2
6.	Rearing techniques of silkworm and Pest and diseases of silkworm.	2
7.	Species of lac insect, host plant identification.	1

8.	Lac cultivation and lac production – seed lac, button lac, shellac, lac-products. Natural enemies of lac and their management.	3
9.	Identification of major parasitoids and predators commonly being used in biological control.	3
10.	Insect orders bearing predators and parasitoids used in pest management.	2
11.	Identification and techniques for mass multiplication of natural enemies.	2
12.	Important species of pollinator, weed killers and scavengers with their importance.	3
13.	Entomophagy, and medicinal uses of insects. Insects of forensic importance and insects in waste management.	4

Suggested Readings:

1. Abrol, D. P. 2013. Beekeeping: A Comprehensive Guide to Bee and Beekeeping. Scientific Publishers, Jodhpur.
2. Aruga, H. 1994. Principles of Sericulture. Oxford & IBH, New Delhi.
3. Atwal, A. S. 2006. The World of the Honey Bee. Kalyani Publ., New Delhi.
4. De Bach, P. 1974. Biological control by Natural enemies. Cambridge University Press.
5. Dhaliwal, G. S. and Arora, R. 2001. Integrated Pest Management: Concepts and approaches. Kalyani Publ., New Delhi.
6. Dhaliwal, G. S. and Koul, O. 2007. Biopesticides and Pest Management. Kalyani Publ., New Delhi.
7. Gautam, R. D. 2008. Biological Pest Suppression. Westville Publising House, New Delhi.
8. Manfred Mackaur, Laster E. Ehler and Jens Roland. 1990. Critical Issues in Biological control- Intercept Ltd. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin-4.
9. Srivastava, K. P. 2004. A Text Book of Entomology. Vol. I, Kalyani Publishers, New Delhi.



AGRSEC-202	Production Technology of Bioagents	2 (0+2)
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Course Status : Skill Enhancement Course
Contact Hours (L-T-P) : 0-0-4
Course Objective : To equip the students with the practical knowledge of mass production techniques, application methods, and quality control practices for the effective use of bioagents in the management of diseases and other stresses.
Course Outcomes (CO) : After the completion of this course, the student will be able to:
CO-1: Acquaint the comprehensive knowledge of bioagents.
CO-2: Gain practical skills in mass production, handling and effective use of bioagents.
CO-3: Understand the challenges and limitations in their production and application for sustainable agriculture.
CO-4: Know the application, storage, shelf life, and marketing strategies for bioagents.

Course Description :

Practical:	CO Mapping
Unit 1: Introduction of Bioagents: History, importance, scope and potential of bioagents; Definitions, concepts and classification of bioagents.	CO-1
Unit 2: Production technology of bioagents: Mass production technology of bioagents viz., <i>Trichoderma</i> , <i>Bacillus</i> , <i>Pseudomonas</i> and entomopathogenic pathogens viz., <i>Metarhizium</i> , <i>Beauveria</i> , <i>Bt</i> and nematodes.	CO-2
Unit 3: Methods of application: Methods of application of bioagents for seeds, seedlings, tubers, sets, soil, etc.	CO-3
Unit 4 Storage and Marketing Bioagents, shelf life, quality control, and marketing. Factors influencing the efficiency of bioagents. Impediments and limitations in production and use of bioagents.	CO-4

Practical Schedule:

S. No.	Name of Topic	No. of Practical
1	Laboratory equipment for biocontrol laboratory.	1
2	Isolation and purification of <i>Trichoderma viride</i> from soil.	2
3	Isolation and purification of <i>Pseudomonas fluorescence</i> , <i>Bacillus thuringiensis</i> and <i>Bacillus subtilis</i> from soil.	2
4	Isolation and purification of <i>Metarhizium</i> and <i>Beauveria</i> from soil and infected insects by these entomopathogenic fungi.	2
5	Mass production technology of <i>Trichoderma viride</i> .	3
6	Mass production technology of <i>Pseudomonas fluorescence</i> .	3
7	Mass production technology of <i>Bacillus subtilis</i> .	3
8	Mass production technology of <i>Metarhizium</i> and <i>Beauveria</i> .	3
9	Mass production technology of <i>Bacillus thuringiensis</i> .	3
10	Visit to bioagents laboratory in the nearby area.	1
11	Field visit for identification of bioagents.	1
12	Methods of evaluation of biopesticides.	2
13	Methods of application of bioagents for seeds, seedlings, tubers, sets, soil etc.	1
14	Shelf life and Quality control of bioagents.	2
15	Factors influencing the efficiency of bioagents.	2
16	Impediments and limitations in the production and use of bioagents.	1



Suggested Readings:

1. Campbell, R. 1989. Biological Control of Microbial Plant Pathogens. Cambridge Univ. Press, Cambridge.
2. Cook, R. J. and Baker, K. F. 1983. The Nature and Practice of Biological Control of Plant Pathogens. APS, St Paul, Minnesota.
3. Dhaliwal, G. S. and Koul, O. 2007. Biopesticides and Pest Management. Kalyani Publ., New Delhi.
4. Mukerji, K. G., Tewari, J. P., Arora, D. K. and Saxena, G. 1992. Recent Developments in Biocontrol of Plant Diseases. Aditya Books, New Delhi.
5. Mukherjee, N. and Ghosh, T. 1998. Agricultural Microbiology. Kalyani Publishers, New Delhi.
6. Rangaswami, G. and Bagyaraj, D. J. 1993. Agricultural Microbiology. Prentice Hall of India Pvt. Limited, New Delhi.
7. Srivastava, K. P. 2004. A Text Book of Entomology. Vol. I, Kalyani Publishers, New Delhi.

NSS-201		National Service Scheme-II	1 (0+1)
Course Status	:	Common Course	
Contact Hours (L-T-P)	:	(0-0-4)	
Course Objective	:	To empower youth with: 1. Leadership skills that promote social and community development. 2. Practical life competencies such as communication, problem-solving, and decision-making that are essential for personal success and social cohesion. 3. Health awareness and practices to support personal well-being and community health, including the promotion of hygiene, nutrition, sanitation, and preventive healthcare. 4. A deeper understanding of yoga as a tool for maintaining a balanced and healthy life.	
Course Outcomes (CO)	:	After the completion of this course, the student will be able to	

Course Description

CO-1: To identify leadership qualities in themselves and others, understand leadership roles in various contexts (community, political, organizational), and explore how youth can contribute to positive societal changes.

CO-2: To gain practical skills for addressing everyday challenges, enhance their communication abilities, and build confidence in making informed decisions. These competencies will aid in both personal and professional growth.

CO-3: To learn about national and regional initiatives aimed at empowering youth, the role of youth in development programs, and how to actively participate in or establish youth-led organizations.

CO-4: To identify the key factors affecting public health, understand the importance of proper sanitation, and recognize the role of personal hygiene in preventing diseases.

CO-5: To lead a healthy lifestyle, understand the social and medical implications of HIV/AIDS and substance abuse, and acquire basic first aid skills.

CO-6: To gain an understanding of yoga's health benefits, learn various practices, and appreciate how yoga can be integrated into daily routines for overall health improvement



Theory:	CO Mapping
Unit 1: Importance and role of youth leadership Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership.	CO-1
Unit 2: Life competencies Definition and importance of life competencies, problem-solving and decision-making, inter personal communication.	CO-2
Unit 3: Youth development programmes Development of youth programmes and policy at the national level, state level and voluntary sector; youth-focused and youth-led organisations.	CO-3
Unit 4: Health, hygiene and sanitation Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health.	CO-4
Unit 5: Youth health, lifestyle, HIV AIDS and first aid Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid.	CO-5
Unit 6: 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.	CO-6

