

FAR WESTERN UNIVERSITY
Faculty of Agriculture
Undergraduate Program in Agriculture
Science



First Semester Syllabus

B. Sc. Agriculture Science First Semester Syllabus

S.N.	Name of the Course	Course Code	CH-Th	CH-Pr	CH-Total	Reference Page
1	Fundamentals of Agricultural Economics	AEC121	2	1	3	
2	Fundamentals of Agro-forestry	AGF111	1	1	2	
3	Fundamentals of Agronomy	AGR121	2	1	3	
4	Fundamentals of Animal Science	ASC121	2	1	3	
5	Fundamentals of Biochemistry	BCH121	2	1	3	
6	Fundamentals of Horticulture	HRT121	2	1	3	
7	Fundamentals of Soil Science	SSC121	2	1	3	
8	Rural Sociology and Educational Psychology	AEX121	2	1	3	
Total			15	8	23	

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	AEC121
Course Title	Fundamentals of Agricultural Economics
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course
Upon completion of this course, the students will be able to understand the general concept and principles of economics, particularly related with production, consumption and distribution.
Course Description
Economics: concept, meaning, definitions and scope of economics; Basic concepts of economic terms; Agricultural economics: meaning, definition, characteristics; Agricultural planning and development in the country; Utility theory: cardinal utility vs. ordinal utility, law of diminishing marginal utility; Indifference curve; Demand: law of demand, elasticity of demand; Price effect, income effect and substitution effect; Supply: law of supply, elasticity of supply; Production: factors of production, input-output relationship; Laws of returns: law of variable proportions and law of returns to scale; Cost concepts and cost curves; Market: market structure and price determination, perfect competition market, monopoly market, monopolistic market and oligopoly market; Distribution theory: characteristics of land and theories of rent, characteristics of labor and theories of wage; Characteristics of capital and theories of interest; National income: concepts and approaches to measurement; Population: Malthusian and Optimum population theories; Tax; Economic systems; Planning process and elements of economic planning.

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1	Concept of economics; Definitions of economics and its evolution (Adam Smith, Marshall and Robbins)	1
2	Scope of economics (subject matter and nature); Brief description about the approaches to economic analysis (deductive and inductive); Microeconomics and macroeconomics; Positive and normative analysis	1

3	Nature of economic theory; Economic laws as generalization of human behavior; Basic concepts of: Rationality and Equilibrium	1
4	Basic concepts: Goods and services; Commodity; Value, cost and price; Need, want, wish, desire and demand	1
5	Basic concepts: Utility and its measurements; Income, wealth, capital and welfare; Consumption and satisfaction; Effort and means	1
6	Concept of agricultural economics; Characteristics of Nepalese agriculture and Nepalese farmers and its comparison in global scenario; Role/ importance of agriculture in the economic development of Nepal	1
7	Brief discussion on agricultural planning and development in the country	1
8	Law of diminishing marginal utility; Assumptions of the law of diminishing marginal utility; Exceptions of the law of diminishing marginal utility; Application of law of diminishing marginal utility in the case of money	1
9	Equi-marginal utility principle; Consumer's equilibrium and derivation of demand curve	1
10	Indifference curve and indifference schedule; Indifference map; Assumptions of indifference curve; Price line; Consumer's equilibrium through indifference curve analysis	1
11	Concept of demand; Determinants of demand (Demand Function); Demand schedule and demand curve; General concept about the changes in demand; Law of demand; Reasons for the law of demand; Exceptions for the law of demand; Use of the law of demand	1
12	Elasticity of demand: Price, income and cross-elasticity of demand; Types of different elasticities of demand; Measurement of the elasticity of demand	1
13	Price effect, income effect and substitution effect; Concept of consumer surplus	1
14	Concept of supply and stock; Supply schedule and supply curve; Law of supply; Determinants of supply; Elasticity of supply	1
15	Production: Process, creation of utility, factors of production, input-output relationship	1
16	Laws of returns: Law of variable proportions and law of returns to scale	1
17	Cost: cost concepts; Types of cost (fixed and variable cost; Explicit	1

	and implicit cost; Social cost; Opportunity cost)	
18	Cost analysis: Total, average and marginal cost; Short-run and long-run cost curves	1
19	Market: Concept of market; Different types of market; Concept of firm and industry	1
20	Basic features of perfectly competitive market, monopoly market and monopolistic market; Brief introduction on oligopoly market	1
21	Price determination under perfect competition market	1
22	Price determination under imperfect market (monopoly and monopolistic market)	1
23	Distribution theory: Meaning; characteristics of land and theories of rent	1
24	Characteristics of labor and theories of wage	1
25	Characteristics of capital and theories of interest	1
26	Concept of national income, national income accounting and circular flow; Approaches for the measurement of national income accounting; Difficulties in measurement of national income	1
27	Population Studies: Concept of population and importance of population studies; Malthusian and Optimum population theory; Determinants of population; Brief discussion on the current Nepalese policies and programs related to population	1
28	Tax: Concept of tax; Direct and indirect taxes; Value Added Tax (VAT); Brief discussion on agricultural taxation in Nepal	1
29	Economic systems: Concepts of economy and its functions; Important features of capitalistic, socialistic and mixed economies	1
30	Policy, plan and program; Planning process; Elements of economic planning	1
Total		30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Review of the different national/international source of agriculture related data and learn how to retrieve such data/information for use in research and study	1
2	Overview of Nepalese agriculture – analysis with the help of basic agricultural statistics and national accounts of Nepal	1
3	Role of agriculture from the point of view of the economic development of Nepal compared with its impact on a typical Nepalese farming household	1

4	Problems in the development of agriculture sector in Nepal and appropriate solution measures: analysis from the perspective of a typical farming household	1
5	Visit to the nearest agricultural farm/market and analysis of the demand for and supply of the selected (any one) agricultural commodities and compare/contrast field observation with the law of demand/supply	1
6	Measurement of the elasticity of demand/supply and explanation of the observed elasticity values	1
7	Study of the major institutions working for agricultural development in Nepal in relation with their role in agriculture and allied sector	1
8	Review of any one of the major existing national agricultural development program/ project	1
9	Preparing an inventory of the existing agriculture sector related acts, laws, rules, regulations, directives, policies and other such legal documents of Nepal	1
10	Review of the National Agricultural Policy (2004)	1
11	Review of different national periodic development plans with reference to the agriculture and allied sectors	1
12	Review of the Agricultural Prospective Plan/APP (1995/96-2014/15)	1
13	Review of the existing Agriculture Development Strategy/ADS (2015-2035)	1
14	Review of the international development efforts (Millennium Development Goals/MDGs, Sustainable Development Goals/SDGs, etc.) in relation with agriculture and allied sectors	2
Total		15

Recommended Reading Materials

1. Chopra, P.N. (2012). *Principles of Economics*. Kalyani Publishers, New Delhi.
2. Joshi, G.R. (2018). *Agricultural Economy of Nepal: Development Challenges and Opportunities*. Sustainable Research and Development Center, Kathmandu.
3. Koutsoyiannis, A. (2003). *Modern Microeconomics*. Palgrave Macmillan, U.K.
4. McConnell, C. R. (2001). *Economics: Principles, Problems, and Policies*. McGraw-Hill Publishing Co., USA.
5. Subba-Reddy, S., Raghu Ram, P., Sastry, T.V.N. and Devi, I.B. (2019). *Agricultural Economics*. Oxford and IBH Publishing Co. Pvt. Ltd., India.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	AGF111
Course Title	Fundamentals of Agro-forestry
Credit Hours	2 (1+1)
Full Marks	50
Theory (Marks)	25
Practical (Marks)	25

Objective (s) of the Course
Upon the completion of this course, the student will have basic knowledge on principles and practices of agro-forestry systems.
Course Description
Concept of agro-forestry; Definition, importance and scope; Roles of trees in fulfilling the basic requirements of people; Characteristics of trees for agro-forestry development and tree improvement; Agro Forestry System (AFS); Classification of the agro forestry system and overview of AFS in Nepal and similar agro-eco-zoning in the world; Tree-crop-interaction, nature of interaction, factors, types, quantifying interactions; Soil management under AFS; Conceptual framework for designing AFS; Project development; ICFAF'S diagnosis and design, diagnostic methods and tools used in AFS; Management of tree in AFS; Tree management, agricultural management, silvi-cultural and management operations; Quantifying agro-forestry products.

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1	Concept of Agroforestry: Definition, importance and scope	1
2	Tree Selection and Improvements	
2.1	Role of trees in fulfilling the basic requirements of people	1
2.2	Characteristic of tree for agroforestry development and tree improvement	1
3	Agroforestry System (AFS)	
3.1	Classification and over-view of Agroforestry System (AFS)	1
3.2	Agroforestry system in Nepal and similar agro-eco-zoning in the world	1
4	Nature of Tree-crop Interaction	
4.1	Factors and types on nature of tree- crop interaction	1
4.2	Quantifying the agro-forestry product	1

5	Soil management under Agroforestry System	
5.1	Approaches of soil-water conservation	1
5.2	Soil fertility management under Agroforestry system	1
6	Designing Agroforestry System	
6.1	Conceptual framework for designing AFS	1
6.2	Factors affecting Agroforestry system	1
7	Project Development in Agro-forestry	
7.1	ICFAF's diagnosis and design	1
7.2	Diagnostic methods and tools used in AFS	1
8	Management of Trees in AFS	
8.1	Management of tree in Agriculture	1
8.2	Agricultural and silvi-cultural management in relation to crop	1
	Total	15

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Tree selection and identification for AFS at different area	
1.1	High hills	1
1.2	Mid Hills	1
1.3	Terai	1
2	Practice in contour farming system	1
3	Preparation 'A'-frames and determines contour lines	1
4	Layout of soil-water conservation systems	1
5	Nursery establishment for AFS	
5.1	Collection and identification of seeds of Agro-forestry trees	1
5.2	Preparation of nursery bed for agro- forestry trees	1
5.3	Seed sowing of agro-forestry trees	1
6	Tree-clinic for AFS	1
7	Training and pruning for Agro-forestry trees	1
8	Height and canopy measurement for selected agro-forestry trees	1
9	Different AFS development (SALT and Home garden)	1
10	Design and Establishment of agroforestry farm at Far Western University (FWU)	1
11	A visit to success story of agro-forestry projects at local level	1
	Total	15

Recommended Reading Materials

1. Chaundawat, B.S. and Gautam, S. K. (1996). *Text of Agro-forestry*. Oxford and IBM Publishing Co. Pvt. Ltd.India.

2. Dwivedi, A.P. (1992). *Agro-forestry: Principles and Practices*. Oxford and IBM Publishing Co. Pvt. Ltd.India.
3. Prakash, Ram. (1991). *Propagation Practices of important Indian Trees*. International Book Distributions, India.
4. Singh, S.P. (1998). *Handbook of Agro-forestry*. Agrotech Publishing Academy, India.
5. Thapa, F. (2001). *Nepalese Flora for Agro-forestry Systems*. S.B. Bhandari Publication, Nepal.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	AGR121
Course Title	Fundamentals of Agronomy
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course

Upon completion of this course, students will be able to explain the basic principles of agronomy for the successful crop production.

Course Description

An introduction to agriculture and agronomy; Weather and climate; Crop growth and yield; Seed and seed quality; Tillage; Cropping system; Soil fertility management; Weed management, Irrigation and drainage; Crop density and plant ideotypes in relation to successful crop production.

Course Breakdown (Theory)

SN	Course Outline	Lectures
1	Introduction to agriculture and agronomy	
1.1	Definition of agriculture, its branches, scope of agriculture in Nepal and agriculture practices in Nepal	1
1.2	Problems of Nepalese agriculture, food security, reasons of food insecurity in Nepal; Agronomy and role of an agronomist in solving the food problems	1
1.3	Green Revolution: Pros and Cons of Green Revolution	1
1.4	Classification of crops: Agronomic classification, based on growing seasons and special purpose classification	1
2	Weather and climatic factors affecting crop production	
2.1	Definition of weather, climate, meteorology and agro meteorology, elements of weather and climate; Climate and weather of Nepal	1
2.2	Solar radiation and its effects in crop production	1
2.3	Temperature and its effects in crop production	1
2.4	Precipitation, relative humidity, wind and their effect on crop growth including role of monsoon on Nepalese farming	1
3	Crop growth and yield	

3.1	Definition of crop growth, growth response curve with time and nature of crops, phases of crop growth, measuring the crop growth	1
3.2	Factors affecting crop growth; Leaf and canopy photosynthesis, growth and maintenance respiration, photorespiration, abiotic and biotic stress	1
3.3	Economic and biological yield, harvest index, potential yield, attainable yield, actual yield, and national average yield; Yield gap analysis and ways in closing the yield gaps	1
4	Soil fertility and nutrient management	
4.1	Soil fertility and productivity, essential plant nutrients and their classification, criteria of essentiality of plant nutrients	1
4.2	Constraints of soil fertility and productivity, management of soil productivity; Organic manures and their classification	1
4.3	Bio-fertilizers and their use; Types of chemical fertilizers (nitrogenous, phosphatic, potassium and micro-nutrients)	1
4.4	Factors affecting manure and fertilizer application, time and methods of fertilizer and manure application; Integrated nutrient management	1
5	Seed and sowing	
5.1	Definition of seed, characteristics of quality seeds and its importance, differences between seed and grain production	1
5.2	Seed germination and its types, factors affecting seed germination, seed dormancy, causes of seed dormancy, different classes of seeds	1
6	Tillage	
6.1	Definition, history and objectives of tillage and characteristics of good soil tilth; Types and methods of tillage: primary, secondary and inter-tillage	1
6.2	Tillage implements and their uses; Conventional and conservation tillage with their advantages and disadvantages	1
7	Irrigation and drainage	
7.1	Definition, objectives of irrigation, methods of irrigation: surface, subsurface, drip and sprinkler irrigation with their comparative advantages and disadvantages	1
7.2	Scheduling of irrigation: Soil moisture depletion; IW/CPE; Critical crop growth stage approaches	1
7.3	Water logging and its effects on crop growth and development, definition and importance of drainage, types of drainage	1

8	Weed and its management	
8.1	Definition of weed, benefits of weeds, harmful effects of weeds	1
8.2	Classification of weeds: Life cycle, morphology, root system, nature of stem, dependence on host crop, family, association; Special, mode of weed seed dispersal	1
8.3	Principles of weed management, methods of weed management (preventive, eradication and control methods, integrated method of weed management)	1
9	Cropping systems	
9.1	Definitions: monoculture, cropping pattern, cropping system, farming system, multiple cropping, sequence cropping, intercropping, mixed cropping, relay cropping, multistoried cropping	1
9.2	Requirements of multiple cropping, advantages of multiple cropping; Definition, principles and advantages of crop rotation; Land utilization index (LUI), cropping intensity (CI) and land equivalent ratio (LER)	1
10	Crop density and optimum plant population	
10.1	Plant ideotypes of different crops; Plant density and optimum plant population, relation of plant density to crop yield, factors affecting plant densities, crop geometry	1
11	Rainfed farming and water harvesting	
11.1	Difference between dryland and rainfed farming, importance of rainfed farming in Nepal	1
11.2	Management of soil moisture under moisture stress condition, water harvesting	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Visit to the nearby farm to identify major crops grown by the farmers	1
2	Collection and identification of seed of field crops	1
3	Purity and germination tests of seed	1
4	Calculation of seed rates based on germination and purity tests	1
5	Introduction to the various weather recording instruments	1
6	Identification of different tillage equipment, tools and machinery	1
7	Practice on sowing of field crops	1
8	Identification of weeds and weeding of major field crops	1

9	Identification of common fertilizers used in Nepal	1
10	Calculation of manures & fertilizers for application	1
11	Practice on application of manures & fertilizers in field crops	1
12	Preparation of improved compost to preserve nutrients	1
13	Study of cropping system of nearby farmers	1
14	Maturity judging and harvesting of field crops	1
15	Study of yield attributes and yield estimation of field crops	1
	Total	15

Recommended Reading Materials

1. Acquah, G. (2015). *Principles of Crop Production: Theory, Techniques and Technology*. India: Pearson Education Inc.
2. De Chandra, G. (2017). *Fundamentals of Agronomy*. New Delhi: Oxford and IBH Publishing Co.
3. Lenka, D. and S. Jena. (2002). *Agronomy for Beginners*. Kalyani Publishers. India
4. Reddy, T.Y. and G.H.S. Reddy. (2016). *Principles of Agronomy*. India: Kalyani Publishers.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	ASC121
Course Title	Fundamentals of Animal Science
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course
Upon the completion of the course, the students will be able to understand the domestication of farm animals and avian species and will also be able to know general husbandry practices of farm animals and avian species.
Course Description
Introduction, importance, scope and problems and statistics of livestock and their products in Nepal; Vocabulary of livestock production and common terms of managerial practices in livestock and poultry farming; Zoological classification of ruminants, non-ruminants and poultry; Breed characteristic of indigenous and exotic breeds of cattle, buffalo, sheep, goat, pig and poultry recognized in Nepal; Housings requirements- types, floor space, feeder and waterer and construction materials for farm animals; Care and management of different categories of ruminants and non-ruminants; Identification, ageing, body weight estimation of farm animals; Handling and restraining of farm animals; Marketing and transportation of farm animals and poultry birds; Feed classification and common feedstuffs and their nutrient content in Nepal; Use of NPN compounds, feed supplements and feed additives; Signs of health and disease and factors affecting health of farm animals; Care and management of sick farm animals and birds; Climate change and its impact on livestock farming, methods of mitigation; Summer and winter stress in farm animals and its amelioration practices; Waste disposal/utilization, sanitation and biosecurity; Different types of farm records and its importance.

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1	Introduction, importance, scope and problems and statistics of livestock and their products in Nepal	1
2	Vocabulary of livestock production and common terms of managerial practices in livestock and poultry farming	1

3	Zoological classification of ruminants, non-ruminants and poultry	1
4	Different between ruminant and non-ruminant animals	1
5	Breed characteristic of indigenous and exotic breeds of cattle common in Nepal - Khaila, Achami, Lulu, Yak, Chauri, Red Sindhi, Sahiwal, Hariyana, Holstein Friesian, Jersey, Brown Swiss	1
6	Breed characteristic of indigenous and Indian breeds of buffaloes common in Nepal- Lime, Parkote, Gaddi, Murrah, Nili-Ravi, Jaffrabadi, Surti, Meshana	1
7	Breed characteristic of indigenous and exotic breeds of goat common in Nepal- Tarai, Khari, Sinhal, Chyangra, Jamunapari, Barbari, Black Bengal, Beetal, Boer, Sannen	1
8	Breed characteristic of indigenous and exotic breeds of sheep common in Nepal- Lampuchhre, Kage, Barawal, Bhyanglung, Merino, Rambouillet, Polworth	1
9	Breed characteristic of indigenous and exotic breeds of poultry recognized in Nepal- Sakini, Ghatikhuile, Pwakhulte, Brahma, New Hampshire, Rod Island Red, Plymouth Rock, Leghorn, Austrolop	1
10	Breed characteristic of indigenous and exotic breeds of poultry common in Nepal- Giriraj; Broilers breeds: Cobb 500, Rose, Hubbard, Indian River; Layer Breeds: Hyline, Lohman, H and N Nick Brown	1
11	Breed characteristic of indigenous and exotic breeds of pigs common in Nepal- Chwache, Bampudke, Hurrah, Pakhribas Black, Hampshire, Landrace, Yorkshire, Duroc, Tamworth	1
12	Housings requirements- types, floor space, feeder and waterer and construction materials for cattle, buffalo, sheep and goat	1
13	Housings requirements- types, floor space, feeder and waterer and construction materials for pig and poultry	1
14	Care and management of ruminant animals- Calf/kid, heifer/grower, dry/suckling animals	1
15	Care and management of ruminant animals- pregnant, milking, breeding male and draft animals	1
16	Care and management of non-ruminants- Piglets, gilt, sows and breeding boar	1
17	Care and management of non-ruminants- Chick, pullet, layers, broiler	1
18	Identification and ageing of farm animals	1

19	Body weight estimation, castration, dehorning/disbudding of farm animals	1
20	Handling and restraining of farm animals	1
21	Marketing and transportation of farm animals and poultry birds	1
22	Feed classification and common feedstuffs and their nutrient content in Nepal	1
23	Use of NPN compounds, feed supplements and feed additives	1
24	Signs of health and disease and factors affecting health of farm animals	2
25	Care and management of sick farm animals and birds	1
26	Climate change and its impact on livestock farming and methods of mitigation	1
27	Summer and winter stress in farm animals and its amelioration practices	1
28	Waste disposal/ utilization, sanitation and biosecurity	1
29	Different types of farm records and its importance	1
30	A cursory review on the micro-syllabus of Fundamentals of Animal Science	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Visit to a cattle/buffalo, sheep/goat farm and observe the housing systems, breeds and records in a commercial farm	1
2	Visit to a poultry shed and piggery and observe the housing systems, breeds and records in a commercial farm	1
3	Identification of external body parts of ruminant animals	1
4	Identification of external body parts of non-ruminant and poultry birds	1
5	Identification of different equipment used in animal science laboratory	1
6	Study of body temperature, respiration rate and pulse rate of different animals	1
7	Casting and restraining of farm animals	1
8	Estimation of body weight by body measurement of cattle and buffalo	1
9	Estimation of body weight by body measurement of sheep, goat and pig	1
10	Age determination by dental formula in ruminant animals	1

11	Different methods of animal identification/numbering	1
12	Cleaning and disinfection of the barn/shed	1
13	Identification of feed ingredients and fodder	1
14	Grooming of dairy cow and practice on hand milking	1
15	Study different types of farm records and their uses	1
	Total	15

Recommended Reading Materials

1. Banerjee, G.C. (1995). *Poultry (3rd Edition)*. Oxford and IBH Publishing. New Delhi.
2. Banerjee, G.C. (2015). *A Text Book of Animal Husbandry (8th Edition)*. Oxford and IBH Publishing. New Delhi.
3. Banerjee, G.C. (2018). *Principles of Animal Nutrition and Feeds*. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
4. Damron, W. S. (2012). *Introduction to Animal Science: Global, Biological, Social and Industry Prospective, (4th edition)*. PHI Learning Pvt. Ltd., M97 Connaught circus, New Delhi 110001, India.
5. Dhital, B and Adhikari, M. (2016). *Principle and Practice of Livestock Production and Management*. Buddha Publication Pvt. Ltd. Kathmandu Nepal.
6. ICAR. (2016). *Handbook of Animal Husbandry*. Indian Council of Agriculture Research, New Delhi India.
7. John, R., Campbell, C., Kenealy, M., Dauglas, C. and Karen, L. (2013). *Animal Science (4th Edition)*. Scientific International Pvt. Ltd. New Delhi India.
8. Prasad, J. (2016). *Animal Husbandry and Dairy Science (6th Edition)*. Kalyani Publishers, New Delhi India.
9. Ranjhan, S.K. (1993). *Animal Nutrition in the Tropics*. Vikash Publishing House Pvt. Ltd. India.
10. Sastry, N.R.S. and Thomas, C.K. (2018). *Livestock Production and Management (5th Edition)*. Kalyani Publication, New Delhi India.
11. Thomas, G.F. and R. E. Traylor. (2014). *Scientific farm animal production; An introduction to Animal Science, 10th edition*. PHI Learning Pvt. Ltd., Rimjhim house, 111 Patparganj, Industrial Estate, Delhi 110092, India.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	BCH121
Course Title	Fundamentals of Biochemistry
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course

Upon the completion of his course, students will be able to understand the basics of biomolecules, their composition and functions as well as various biochemical process that takes place in living beings.

Course Description

Importance of biochemistry; Water, pH and buffer (biological buffers); Nomenclature and classification of enzymes, classification, structure and function of important bio-molecules; Metabolism of important bio-molecules, central metabolic pathways, and introduction to polymerase chain reaction.

Course Breakdown (Theory)

SN	Course Outline	Lectures
1	Introduction: Introduction, history, scope and practical significance of biochemistry in agriculture	1
2	Water, pH and Buffers	
2.1	Ionization of water; Acid and base (Arrhenius, Bronsted-Lowry, Lewis concept); Dissociation constant.	1
2.2	Buffer system and importance of biological buffer system	1
3	Biomolecules and the Cell (prokaryotic and eukaryotic cells)	1
4	Carbohydrates	
4.1	Definition and classification of carbohydrates on the basis of hydrolysis, reducing behavior and solubility and functions of carbohydrates	1
4.2	Structure, physical and chemical properties of carbohydrates	1
4.3	Biosynthesis of sucrose, starch and glycogen	1
4.4	Biodegradation of sucrose, starch and glycogen	1
5	Lipids	
5.1	Definition, structure, functions and classification of fatty acids	1

5.2	Definition, functions and classification of lipids	1
5.3	Biosynthesis of triacylglycerides	1
5.4	Biodegradation of triacylglycerides	1
6	Amino acids and Proteins	
6.1	Definition, structure, properties and functions of amino acids	1
6.2	Peptide bond: Classification of proteins on the basis of functions; Structural organization of proteins	1
6.3	Overview of amino acid biosynthesis	1
6.4	Degradation of amino acids	1
6.5	Transamination, deamination, trapping of ammonia and its detoxification	1
7	Nucleic Acids	
7.1	Nitrogenous bases (purines and pyrimidines), nucleoside, nucleotides with structure	1
7.2	Structure, functions and types of nucleic acid (DNA and RNA), Watson and Crick model of DNA	1
7.3	Types of RNA: mRNA, tRNA, rRNA, hnRNA	1
7.4	Replication and transcription of DNA	1
7.5	Translation and termination	1
8	Enzymes	
8.1	Terminologies, nomenclature and classification of enzymes.	1
8.2	Mechanism of enzyme action; Michaelis Menten equation-its significance	1
8.3	Factors affecting enzyme activity and enzyme specificity	1
9	Metabolic Pathways	
9.1	Biochemistry of glycolysis, fate of pyruvate	1
9.2	Biochemistry of TCA cycle, amphibolic nature of TCA cycle	1
9.3	Site, process and significance of pentose phosphate pathways	1
10	Electron Transport Chain	
10.1	Enzymes involved in oxidation-reduction; electron carriers; oxidative phosphorylation	1
10.2	Shuttle system involved in ETC; inhibitors of ETC	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Introduction and uses of laboratory equipment and glass wares and lab safety	1
2	Preparation of standard solution (normal, molar and molal)	1

3	Preparation of buffer solution (acetate buffer, phosphate buffer)	1
4	Detection of carbohydrate by Molisch and Anthrone tests	1
5	Detection of amino acids by Millon's test and Ninhydrin test	1
6	Detection of protein by Biuret test	1
7	Saponification of fat	1
8	Enzymatic actions of potato oxidase, urease and catalase	1
9	Quantitative estimation of reducing sugar in the provided sample	1
10	Quantitative estimation of proteins in the provided sample	1
11	Demonstration of differential centrifugation	1
12	Demonstration of gel electrophoresis	1
13	Demonstration of paper chromatography	1
14	Demonstration of Spectrophotometry and Colorimetry	1
15	Preparation of tissue culture media	1
	Total	15

Recommended Reading Materials

1. Basnet, R. C. (2004). *Textbook of Biochemistry*. Sewa Printing Press, Kathmandu.
2. Lehninger, A. L., Nelson, D. L. and Michael, M. C. (1993). *Principles of Biochemistry*. CBS Publishers and Distributors, New Delhi, India. M. C.
3. Mu, P. and Plummer, D. T. (2001). *Introduction to Practical Biochemistry*. Tata McGraw-Hill Education, India.
4. Rameshwar, A. (1993). *Practical Biochemistry: A Basic Course*. Kalyani Publication, New Delhi, India.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	HRT121
Course Title	Fundamentals of Horticulture
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course

The students will be acquainted with the basic concept, principles and practices related to horticultural crop production.

Course Description

Meaning, branches and relation of horticulture with other disciplines; Classification of horticultural crops, status and potential of horticulture development in Nepal; Factors affecting horticulture crop production and measures to overcome them, Introduction to various types of horticultural enterprises, orchard establishment and management; Basics of plant propagation and various methods; Growth and development of horticultural plants; Major classes of plant growth regulator and their commercial use in horticulture; Basic principles and methods of training and pruning; Basic principles of off- season and protected horticulture; Organic horticulture crop production in Nepal; Concept of high density planting, multi- storied cropping, multiple cropping and agro forestry with horticultural crops; Indigenous horticultural crops in Nepal; Principle of urban and peri-urban horticulture; Vermi composting, soil less culture and riverbed horticulture.

Course Breakdown (Theory)

SN	Course Outline	Lectures
1	Introduction	1
1.1	Meaning of horticulture, its branches and relation with other disciplines	
1.2	Importance, scope and present status of horticulture in Nepal along with major constraints in its development	1
1.3	Classification of horticultural crops	1
1.4	Horticultural zoning of Nepal and its economic significance	1
2	Environmental Factors Affecting Horticultural Crop Production	
2.1	Effect of temperature, light, humidity, rainfall, wind and their	1

	stress on production	
2.2	Measures to overcome environmental stress	1
3	Enterprises in Horticulture	
3.1	General introduction to types of horticultural enterprises (Orcharding, nursery raising, ornamental gardening, landscape, vegetable farming, seed production and post-harvest handling and preservation)	1
4	Orchard Establishment and Management	
4.1	Site selection and layout of orchard	1
4.2	Planting, soil and water management practices, wind break and shelter belts	1
4.3	Fertility and weed management	1
5	Basics of Plant Propagation	
5.1	Introduction of plant propagation, sexual method	1
5.2	Asexual methods	1
5.3	Cutting and layering	1
5.4	Budding and grafting	1
8.5	Apomixis, specialized vegetative parts, micro and mist propagation	1
6	Growth and Development in Horticulture Crop	
6.1	Concept of growth and development, dormancy (seed and bud)	1
6.2	Germination, juvenility and maturity	1
6.3	Flowering, fruitset, fruit growth and development	1
6.4	Fruit maturity and ripening, unfruitfulness, fruit drop	1
6.5	Tuber, rhizome and bulb development, senescence	1
7	Plant Growth Regulators	
7.1	Types of plant growth substances (auxin, gibberellins, cytokinins, ethylene and inhibitors), and their major functions	1
7.2	Commercial uses of PGRs in Horticulture	1
8	Training and Pruning	
8.1	Basic principles and objectives of training and pruning	1
8.2	Various system/ methods of training and pruning	1
9	Basic principles of off season and protected horticulture and their prospects and constraints in Nepal	1
10	Importance and prospects of organic horticultural crop production in Nepal	1
11	Concept of high density planting, multi-tier cropping, multiple cropping and agro forestry	1
12	Importance and prospects of indigenous horticultural plants	1

	in Nepal	
13	Principles of urban and peri-urban horticulture; Vermiculture, hydroponics and aeroponics, and river bed farming	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Mapping of Nepal in terms of agro-climatic zones and potential regions for growing major horticultural crops	1
2	Identification of fruit, vegetable, plantation, medicinal, spices and ornamental plants	1
3	Identification of horticultural tools and equipments; manures and fertilizers; hormones and micronutrients	1
4	Orchard layout for different system of fruit planting	1
5	Preparation of pit for planting fruit saplings	1
6	Preparation of nursery bed for sowing of vegetable seed	1
7	Propagation practice in horticultural plants	
7.1	Cutting	1
7.2	Layering	1
7.3	Grafting	1
7.4	Budding	1
8	Training practice in horticultural plants	1
9	Pruning practice in different horticultural plants	1
10	Preparation and application of Bordeaux formulation	1
11	Preparation of hot bed for germination of vegetable seed in winter	1
12	Preparation of different concentrations of PGR for horticultural uses	1
	Total	15

Recommended Reading Materials

1. Chattopadhyay, T.K. (2001). *A Text Book on Pomology. Vol I.* Kalyani Pulishers, India.
2. Prasad, S. and U. Kumar. (2017). *Principles of Horticulture, 2nd edition.* Agrobios, Jodhpur, India.
3. Shrestha, G.K., Shakya, S.M., Baral, D. R. and Gautam, D. M. (2001). *Fundamentals of Horticulture (2nd Edition).* Inst. Agri. and An. Sci, Rampur, Chitwan, Nepal.
4. Shrestha, G.K., Shakya, S.M., Baral, D. R. and Gautam, D. M. (1993). *Laboratory Manual on Fundamentals of Horticulture.* IAAS, Rampur.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	SSC121
Course Title	Fundamentals of Soil Science
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course

The main objective of the course is to provide the student about fundamental knowledge and skills within the different areas of soil science to enhance their understanding on relationship between soil and crop production.

Course Description

Soil: Pedological and edaphological concepts; Earth's crust; Composition: Rocks and minerals; Weathering; Components of soils; Soil physical properties: soil texture, textural classes, particle size analysis, soil structure, classification, soil aggregates and their significance, bulk density and particle density of soils and porosity, their significance and manipulation, soil color; Soil Chemical Properties: Soil colloids, properties, nature, types and significance; Layer silicate clays, their genesis and sources of charges, adsorption of ions, ion exchange, CEC and AEC, factors influencing ion exchange and its significance; Soil organisms and their beneficial and harmful roles; Soil Health: Concept of Soil Quality/Health, characteristics of a healthy soil, soil health indicators; Physiographic units of Nepal.

Course Breakdown (Theory)

SN	Course Outline	Lectures
1	Introduction	
1.1	Definition, concepts and functions of soil	1
1.2	History of soil science	1
1.3	Approaches of soil science	1
1.4	Composition of soil	1
1.5	Branches of soil science, the soil profile and its layers	1
2	Physical Properties of Soil	
2.1	Soil Texture: Definition, methods of textural analysis, Stoke's law- assumption and limitations, soil textural classes	1
2.2	Soil Structure: Definition, classification, genesis of soil structure,	1

	management of soil structure	
2.3	Bulk density, particle density and porosity	1
2.4	Soil Consistency, Attenberg's constant	1
2.5	Soil Color	1
2.6	Soil Aeration	1
3	Chemical Properties of Soil	
3.1	Soil pH and nutrient availability	1
3.2	Acidic soils- pools, causes and management	1
3.3	Saline soils- causes and management	1
3.4	Sodic soils and saline-sodic soils- causes and management	1
3.5	Buffering capacity of soil and liming	1
3.6	Soil colloids and its properties	1
3.7	Types of soil colloids	1
3.8	Layer silicate clays, their genesis and sources of charges	1
3.9	Ion Exchange phenomenon, AEC	1
3.10	Cation Exchange Capacity	1
4	Soil Biology	
4.1	Soil Organism and their Classification	1
4.2	Beneficial and Harmful Role of Soil Organisms	1
5	Soil Health and Quality	
5.1	Concept of soil quality/Health	1
5.2	Characteristics of a healthy soil	1
5.3	Soil health indicators	1
6	Rocks and Minerals	
6.1	Evolution and composition of earth	1
6.2	Rocks	1
6.3	Minerals	1
6.4	Weathering of rocks and minerals	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Precautions to be taken while working in soil science laboratory	1
2	Identification and function of soil science laboratory equipment	1
3	Collection and preparation of soil sample from crop field	1
4	Collection and preparation of soil sample from orchard	1
5	Soil textural determination by Feel method	1
6	Determination of soil consistency	1
7	Particle size analysis by Hydrometer method	1

8	Determination of soil structure	1
9	Soil color determination	1
10	Determination of bulk density of soil	1
11	Determination of particle density of soil	1
12	Determination of pH of soil	1
13	Identification of soil forming rocks	1
14	Identification of soil forming minerals	1
15	Study of soil as a natural body	1
	Total	15

Recommended Reading Materials

1. Biswas, T. D. and Mukherjee, S. K. (1987). *Text Book of Soil Science*. Tata McGraw Hill Publishing Co., New Delhi.
2. Brady, N. C. and Weil, R. R. (2012). *Nature and Properties of Soils (14th Edition)*. Macmillian Publishing Co. Inc., New York
3. Das, D. K. (1997). *Introductory Soil Science*. Kalyani Publishers, New Delhi.
4. Gupta, P. K. (2007). *Soil, Plant, Water and Fertilizer Analysis*. AGROBIOS, Jodhpur, India.
5. Foth, H. D. (1990). *Fundamental of Soil Science (8th Edition)*. Wiley Eastern Pvt. Ltd., New Delhi, India.
6. Jaiswal, P. C. (2006). *Soil, Plant and Water Analysis (2nd Edition)*. Kalyani Publishers, Ludhiana
7. KC, T. B. (1991). *Introduction to Soils and Soil Fertility*. Institute of Agriculture and Animal Science, Chitwan, Nepal.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	AEX121
Course Title	Rural Sociology and Educational Psychology`
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course
To impart knowledge to the students on sociological and psychological aspects of rural people and to acquaint with some important features of rural society and application in the field of agriculture.
Course Description
Rural Sociology - Meaning, nature, scope and relationship, importance, social values and attitudes; Nepalese rural society, rural urban continuum, social groups, social process, social movement, social stratification, inequality, culture concepts; Rural-social institutions, social problems and their solution, socialization, social change, social system, social deviance, social control; Leadership; Educational psychology- Meaning, concept; Education, learning: Learning theories, basic psychological concepts; Motivation, emotions, attitudes, social perception.

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1.	Sociology: Meaning, nature, scope, school of thought	1
2	Rural Sociology: Meaning and importance in agrarian society; Rural- urban continuum	1
3	Cultural Value System - Meaning, concept, definition, types	1
4	Nepalese Rural Society: Characteristics; Cultural concepts - Culture, Customs, Folkways, Morales, Taboos, Rituals and Traditions - Meaning, definition and their role in Agricultural society	1
5	Rituals, festivals and ceremonies in different ethnicity of FWP	1
6	Nepalese Rural Society, Far Western Rural Societies: Introduction and characteristics (culture, rituals and traditions)	1
7	Social Groups: Meaning and definition, classification of groups	1
8	Social Processes (process of social interaction): Basic concepts, social amalgamation, assimilation, cooperation, competition,	1

	enculturation, acculturation, integration	
9	Conflict: Stages, conflict intensity continuum, conflict management (accommodation, adjustment, consensus, collaboration) process, conflict management techniques	1
10	Social Movement: Meaning and causes of social movement, early and recent theories, types of social movement	1
11	Social Stratification: Meaning, bases (class, caste, age, gender), viewpoints (Theories) on stratification: functional, Marx and Max Weber	1
12	Social Stratification and Inequality: Caste/ ethnic and regional exclusion in Nepal and FWP (with example)	1
13	Introduction of agrarian society of Far-Western Terai and their social and agricultural characteristics	1
14	Introduction of agrarian society of Far-Western Hilly regions (lower, mid and upper) and their social and agricultural characteristics	1
15	Rural-social Institutions: Concept and functions	1
	(a) Social Institutions: Household, family types, marriage system	
	(b) Economic Institutions: Farming system in Far- Western Province, Bank and Cooperatives, Agriculture and Livestock Industry.	1
	(c) Educational Institution; Political Institutions: level of governments	1
	(d) Religious institutions: Types of religion, their maintenance and followers	
16	Social System: Meaning and elements of social system	1
17	Socialization: Meaning, stages and agents of socialization	1
18	Overview of theories of socialization/ self by Cooley, Mead and Freud	1
19	Social Change: Meaning, factors and theories of social change and impact of technology in rural society	1
20	Social Deviance and Social Control: Meaning, types, mechanisms	1
21	Education, Psychology, Educational psychology: Definitions and concept	1
22	Basic principles of human behavior – Sensation, Attention, Perception: Meaning, characteristics	1
23	Concept of learning: Three domains of learning Types of learners: Theorist, pragmatist, reflectors and activist Learning cycles: Conceptualization, construction and the dialogue	1

24	Learning theories: Learning theories and Thorndike's four Law of learning	1
25	Effective teaching learning elements, teaching learning process Factors affecting effective teaching learning situation	1
26	Basic psychological concepts; Intelligence and Personality (Big five personality)	1
27	Motivation: Concept, definition theories (Maslow, Heignberg's, X, Y and Z); Significance in teaching and learning.	1
28	Methods of educational psychology: Introspection, observation, clinical methods, sociometry	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Visit to a village in Tikapur (Eg. Bangaun/ Rampur/ Ghiya/ Dhansingpur/ Khakraula/ Asneri) to study the characteristics of rural society	1
2	Study of rural social institutions and organizations - School or cooperative or rural municipality/ local government authorities/ Bank (study the function and organogram)	1
3	Visit to a rural community to identify different social groups (user groups, farmers' groups and saving groups) to which the farmers are associated	1
4	Visit to a village to list out the taboos and folkways common in the village	1
5	Identification of important value systems in the rural setting as a means of social control	1
6	Identification of rural personality traits that affect the development of personality in rural situation	1
7	Conducting role play technique by the students to exhibit different conflict management (group exercise)	1
8	Listing social problems in rural society (group exercise)	1
9	Mitigation measures of social problems (group discussion)	1
10	Practice on personality and intelligence measurement techniques (group exercise)	1
11	To study behavior of farmers during crop harvesting (direct participatory observation)	1
12	To study behavior of farmers during marketing of product in Haat-bazar (indirect participatory observation)	1

13	Practicing sociometry (group exercise)	1
14	Study of different strata in society (Gender/ Class/ Ethnicity and Caste/ Age/ Regional)	1
15	Identification of agricultural technologies with pros. and cons. perceived in rural society	1
	Total	15

Recommended Reading Materials

1. Bhushan, V. and Sachdeva, D. R. (1994). *An Introduction to Sociology*. Kitab Mahal, Allahabad, India.
2. Chitambar, J. B. (1973). *Introductory Rural Sociology*. Wiley Eastern Limited, India.
3. Regmi, R. R. (2001). *The Essentials of Sociology*. Published by Sandeep Raj Regmi, Kathmandu, Nepal.
4. Rao, U. (2008). *Advanced Educational Psychology*. Himalaya Publishing House, New Delhi.