

FAR WESTERN UNIVERSITY
Faculty of Agriculture
Undergraduate Program in Agriculture
Science



Seventh Semester Syllabus

B. Sc. Agriculture Science Seventh Semester Syllabus

Seventh Semester

S.N.	Name of the Course	Course Code	CH-Th	CH-Pr	CH-Total	Reference Page
1	Environmental Science, Climate Change and Disaster Management	ECD721	2	1	3	
2	Field Crop Improvement	PLB721	2	1	3	
3	Geo-Informatics and Nanotechnology for Precision Farming	SSC711	1	1	2	
4	Post-Harvest Horticulture	HRT721	2	1	3	
5	Principles and Practices of Animal Breeding	ASC721	2	1	3	
6	Principles and Practices of Irrigation	AEN721	2	1	3	
7	Social Mobilization and Community Development	AEX721	2	1	3	
8	Economics of Crop and Animal Production	AEC701	0	1	1	
9	Agri-Enterprise Learning and Development	AED701	0	1	1	
Total			13	9	22	

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	ECD721
Course Title	Environmental Science, Climate Change and Disaster Management
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course
Students will learn about various aspects of environmental studies, ecosystem approach, climate change and disaster management.
Course Description
Introduction to environmental science and environmental studies; Various environmental issues; EIA and IEE; Climate change; Natural resource management and agriculture; Disasters and its management; Policies and institutional mechanisms.

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1	Introduction to Environmental Science and Environmental Studies	
1.1	Introduction to environmental science and environmental studies, objectives, importance and scope of environmental studies	1
1.2	Ethical worldviews, human and environment interaction	1
2	Ecosystem Principles Processes	
2.1	Ecosystem; Ecology and divisions of ecology; Energy flow in an ecosystem; Strength of natural ecosystem	1
2.2	Aspect of ecosystem; Comparison between natural and regulated ecosystem	1
2.3	Introduction to home garden, its principles, suitability in Nepalese context; Interactions and interrelationship of various components in home garden	1
3	Various Environmental Issues	
3.1	Environmental issues and types of environmental hazards	1
3.2	Land fragmentation in agriculture, ecological footprint and	1

	genetic pollution	
3.3	Soil erosion, landslides, invasive species and urbanization	1
3.4	Issues of solid wastes management in Nepal	1
2.5	Pesticide misuse, impact of long term use of agrochemicals	1
4	EIA and IEE	
4.1	Introduction to Environmental Impact Assessment (EIA); Emergence of EIA; History of EIA in Nepal	1
4.2	Definition and types of EIA; Project Types, impacts and their types and the EIA processes and Project cycle	1
4.3	Screening and Initial Environmental Examination (IEE): Objectives of screening, screening procedure; Initial environmental examination and methods for IEE	1
4.4	Principles and steps of EIA; Comparison between IEE and EIA	1
4.5	Methods of impact identification of agricultural intensification; Environmental Audit	1
5	Climate Change and Climatic Variability	
5.1	Introduction to climate change and climatic variability, greenhouse effect, global warming and global dimming; Evidences of climate change; Vulnerability of women to climate change	1
5.2	Causes of climate change; uncertainty about climate change and weather forecasting	1
5.3	Three tier relationship of climate change and agriculture	1
5.4	Adaptation, mitigation and local innovation strategies to combat climate change; Nepal initiatives to limit climate change impacts	1
5.5	Climate Smart Agriculture: objectives, dimensions and applicability; Needs and opportunities of climate smart village approach	1
6	Natural Resource Management and Agriculture	
6.1	Introduction, concepts, principles and importance of natural resource management	1
6.2	Protected areas of Nepal	1
6.3	Integrated natural resource management in agriculture	1
6.4	Concept, principles and steps of community based biodiversity management	1
6.5	Conservation of traditional knowledge, value addition and economic incentives for ecological farming	
7.	Natural Disasters	
7.1	Meaning and nature of natural disasters, their types and effects;	1

	Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions; Heat and cold waves; Climate change: global warming, sea level rise, ozone depletion.	
7.2	Disaster management- Concept of disaster management, national disaster management framework; Financial arrangements; Role of I/NGOs/ Community based organizations and media in disaster management	1
7.3	Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.	1
8	Policies and Institutional Mechanisms	
8.1	CBD and its implication in agriculture; Nagoya protocol; Farmers right; Environmental laws, Convention and Treaties and ITPGRFA	1
8.2	Various acts, policies and institutional mechanisms for combating climate change in Nepal	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Data collection and report preparation on linkages of farmers with agro-ecosystem and records of agro-biodiversity components	1
2	Documentation of agro-biodiversity present at around campus vicinity	1
3	Determine the minimum size of quadrat by species area curve method	1
4	Measurement of density, frequency, abundance and importance value index from species data	1
5	Calculation of effective number of species, evenness and Simpson index	1
6	Study of wetland flora and fauna near to the campus vicinity	1
7	Visit to any one : waste water treatment or landfill site or waste management practices at local level like municipality and report preparation	1
8	Document the awareness about pesticides and pesticides handling measures at a locality	1
9	Determination of dissolved oxygen in water by Winkler's method	1
10	Determination of dissolved carbon dioxide and dissolved solids	1
11	Seed collection and catalogue preparation of local and improved	1

	crop varieties	
12	Preparation of statement of environmental impacts of local industries	1
13	Study of on-farm conservation strategies adopted by farmers near to campus vicinity	1
14	Visit to any protected areas of Nepal and report writing	1
15	Study and analyze the trend of global warming from multi-year temperature data till last year using NASA – Power and other data sources	1
	Total	15

Recommended Reading Materials

1. Altieri, M. A. (1987). *Agro ecology: the scientific basis of alternative agriculture*. Division of Biological Control. University of California, US.
 2. Dessler, A. (2015). *Introduction to Modern Climate Change (2nd edition)*. Texas A & M University, US.
 3. Khadka, R. B., Bisset, R. and Peter, A. (1986). *EIA Training Manual for Professionals and Managers*. IUCN.
 4. Odum, E. P. (1996). *Fundamentals of Ecology*. Saunders Company, USA.
 5. Sharma, P. D. (1992). *Ecology and Environment*. Rastogi Publication, Meerut, India.
 6. Sthapit, B., Shrestha, P. and padhyay, M. (2012). *On-farm Management of Agricultural Biodiversity in Nepal*. Bioversity International.
- Tivy, J. (1990). *Agricultural Ecology*. Longman Group Ltd., Essex, UK.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	PLB721
Course Title	Field Crop Improvement
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course
This course provides insight on plant breeding approaches for crop improvement, develop understanding on plant genetic resources and innovative approaches in plant breeding for field crop improvement.
Course Description
Plant breeding history and achievements, inter-relationship; Plant genetic resources; Breeding for biotic and abiotic stress tolerance; Breeding for quality improvement; Breeding objectives and approaches used in different crops; Crop ideotypes; Participatory and evolutionary plant breeding; Gnotype-environment interaction; Varietal registration, release and notification, seed production and inspection; Plant breeding organizations, rules and regulations.

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1	History of plant breeding in Nepal, plant breeding phases and their activities	1
2	Conventional and modern approaches of plant breeding, principles of plant breeding, relationship with other sciences	1
3	Definition of plant genetic resources, gene pool, kinds of germplasm sources and significance	1
4	Germplasm collection, conservation, utilization, introductions and acclimatization	1
5	Biotic and abiotic stress in crop plants and their impacts	1
6	Breeding for disease resistance, mechanisms and types of disease resistance, gene for gene hypothesis, disease scoring, practical achievements	1
7	Breeding for insect resistance, mechanisms of insect resistance, insect pest damage scoring, practical achievements	1
8	Breeding for abiotic stress tolerance, types of abiotic stress	1

9	Drought tolerance: Introduction, mechanism of drought tolerance, breeding methods, achievements	1
10	Salinity tolerance: Introduction, mechanism of salinity stress tolerance, breeding methods, achievements	1
11	Heat stress tolerance: Introduction, mechanisms, breeding methods, achievements	1
12	Breeding for quality improvement: Introduction, quality traits, nutrition & nutrients, nutritional quality of cereals, fruits and vegetables, sources of nutritional quality, breeding methods, trait associated gene identification, achievements	1
13	Center of origin, law of parallel series, exploitation of heterosis through hybridization, earlier experiments on crop hybridization in cereals, fruits and vegetable crops, types of hybridization and matings	2
14	Apomixis and heterosis breeding, significance in crop improvement	1
15	Chromosomal variations and inheritance in wheat, rice, maize, tomato, soyabean, bean and rapeseed	1
16	Crop improvement activities and breeding methods in Rice	1
17	Crop improvement activities and breeding methods in Wheat and Barley	1
18	Crop improvement activities and breeding methods in Maize	1
19	Crop improvement activities and breeding methods in Pulses (chickpea, soybean, blackgram, mungbean etc.)	1
20	Crop improvement activities and breeding methods in oilseed (rapeseed, mustard, linseed, sunflower, sesame etc)	1
21	Crop improvement activities and breeding methods in vegetable (tomato, potato, onion, brinjal and brassica species etc)	1
22	Crop improvement activities and breeding methods in spice and medicinal crops (turmeric, ginger, garlic, corriander, black pepper, cardamom etc)	1
23	Ideotype concept in crop improvement, objectives and challenges	1
24	Characteristics of crop ideotype (cereal, legumes, oilseeds, spices, fruits and vegetable crops)	1
25	Genotype by environment interaction and multi environment trials in plant breeding, on station and on farm trials, varietal registration, release and notification, classes of seeds	1
26	Role of participatory plant breeding in varietal development and adoption by farmers	1

27	Role of evolutionary plant breeding in climate resilient variety development, climate resilient crops and their use	1
28	National and International plant breeding organizations	1
29	National and International rules and regulations regarding plant variety protection and benefit sharing, plant breeder's right and farmer's right, germplasm conservation and utilization through national and international gene banks	1
Total		30

Course Breakdown (Practical)

SN	Course Outline	Lectures
1	Conventional and molecular tools used in plant breeding	1
2	Layout and establishment of field experiment	c
3	Field trial data recording	1
4	Handling segregating materials	1
5	Collection of germplasm of field crops and preservation	1
6	Study and collection of landraces and their important traits	1
7	Study and collection of popular released varieties and their important traits	1
8	Hybridization in self-pollinated crops	1
9	Hybridization in cross-pollinated crops	1
10	Estimation of genetic gain	1
11	Estimation of heritability and heterosis	1
12	Hybrid seed production using A, B and R system	1
13	Seed production and maintenance in self-pollinated crops	1
14	Seed production and maintenance in cross-pollinated crops	1
15	Visit to seed production plot and field inspection	1
Total		15

Recommended Reading Materials

1. Abdin, M. Z., Kiran, U. and Ali, A. (Eds.). (2017). *Plant Biotechnology: Principles and Applications*. Springer Singapore.
2. Brown, J. (2008). *An introduction to Plant Breeding*, Jack Brown, Peter DS Caligari.
3. Joshi, B. K. (2017). *Plant Breeding in Nepal: Past, present and future*. Journal of Agriculture and Forestry University, 1, 1-33.
4. Ram, M. (2014). *Plant Breeding Methods*. PHI Learning Pvt. Ltd.
5. Singh, B. D. (2015). *Plant Breeding: Principles and Methods*. Kalyani publishers.
6. Sleper, D. A. and Poehlman, J. M. (2006). *Breeding Field Crops* (No. Ed. 5). Blackwell publishing.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	SSC711
Course Title	Geo-Informatics and Nanotechnology for Precision Farming
Credit Hours	2 (1+1)
Full Marks	50
Theory (Marks)	25
Practical (Marks)	25

Objective (s) of the Course

The objective of this course is to provide theory as well as hand-on skill to students for various applications in Remote-Sensing (RS), GIS and related technology for precision agriculture.

Course Description

Precision agriculture Geo-informatics, GPS, GIS, System simulation, Remote sensing, Nanotechnology.

Course Breakdown (Theory)

SN	Course Outline	Lectures
1	Precision agriculture: Concepts and techniques, various tools of precision agriculture used in abroad and Nepal	1
2	Common issues and concerns of precision agriculture in Nepalese agriculture	1
3	Geo-informatics: Definition, concepts, tool and techniques; their use in Precision Agriculture	1
4	Common issues and concerns of geo-informatics in Nepalese agriculture	1
5	Crop discrimination, yield monitoring and forecasting, soil mapping, fertilizer recommendation using geospatial technologies	1
6	Spatial data and their management in GIS	1
7	Geodesy and its basic principles	1
8	Remote sensing concepts and application in agriculture; Image processing and interpretation	1
9	Global positioning system (GPS), components and its functions	1
10	System Simulation: Concepts and principles, introduction to crop Simulation Models and their uses for optimization of agricultural	1

	inputs	
11	Crop cutting: Scope, methodology and importance in forecasting crop yield	1
12	STCR approach for precision agriculture	1
13	Nanotechnology, definition, concepts and techniques	1
14	Brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors	1
15	Use of nano-technology in tillage, seed, water, fertilizer, plant protection for scaling-up farm productivity	1
	TOTAL	15

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Introduction to GIS software, spatial data creation and editing	1
2	Introduction to image processing software	1
3	Visual and digital interpretation of remote sensing images	1
4	Generation of spectral profiles of different objects	1
5	Supervised and unsupervised classification and acreage estimation	1
6	Multispectral remote sensing for soil mapping	1
7	Creation of thematic layers of soil fertility based on GIS	1
8	Creation of productivity and management zones	1
9	Fertilizer recommendations based of VRT and STCR techniques	1
10	Crop stress (biotic/abiotic) monitoring using geospatial technology	1
11	Use of GPS for agricultural survey	1
12	Crop cut survey and its application in estimation of cereal yields	1
13	Crop simulation modeling in applying agricultural decision making	1
14	Formulation, characterization and applications of nanoparticles in agriculture	1
15	Project formulation and execution related to precision farming	1
	TOTAL	15

Recommended Reading Materials

1. Asrar, G. (1989). *Theory and Application of Optical Remote Sensing*. John Wiley and Sons, New York.

2. Lillisand, T. M., Kiefer, R. W and Chipman, A. (2004). *Remote Sensing and Image Interpretation (5th edition)*. John Wiley and Sons, New York.
3. Steven, M. D. and Clark, J. A. (1991). *Application of Remote Sensing in Agriculture*. Butterworths, London.

FAR WESTERN UNIVERSITY
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Course Code	HRT721
Course Title	Post-Harvest Horticulture
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course
Upon the completion of this course the students will get basic knowledge and skills on post-harvest physiology, handling, processing and preservation and storage of the fresh horticultural produces.
Course Description
Importance and scope of postharvest horticulture; Postharvest physiology of fruits, vegetables and cut flowers; Maturity judgment and maturity indices; Causes of deterioration; Transpiration, respiration, ethylene production, physiological disorders, post-harvest insect pest and post-harvest diseases; Packaging and packing house operations; Sorting, grading, curing, waxing, trimming, de-handing, chemical treatment, sugar pulsing, pre-cooling, fumigation and packaging; Storage of fruit and vegetables, factors affecting storage, different methods of storage; Marketing and markets for fruit, vegetables and cut flowers; Principles and methods of preserving fruit, vegetables and ornamental; Quality control and assessment, organoleptic evaluation; Handling of specific fruits, vegetables and cut flowers; Principles and methods of processing and preservation

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1	Introduction	
1.1	History and importance of post-harvest horticulture	1
2	Post-harvest Physiology	
2.1	Post-harvest physiology of fruits, vegetables and ornamentals	1
2.2	Transpiration: Factors affecting transpiration and effects of transpiration on post-harvest	1
2.3	Respiration: Aerobic and anaerobic respiration, Electron transport system	1
2.4	Effects of respiration on post-harvest	1
2.5	Ripening: Physiological changes during ripening control of	1

	ripening	
2.6	Ethylene: Mode and mechanism of ethylene action, biosynthesis of ethylene, post-harvest use of ethylene	1
3	Maturity Determination	
3.1	Physiological maturity methods for maturity judgment, method and time of harvesting	1
3.2	Commercial maturity for maturity judgment, method and time of harvesting	1
4	Factors Responsible for Deterioration of Horticultural Produce	1
5	Protection Measures of Post-harvest Products	
5.1	Post-harvest diseases	1
5.2	Control measures of post-harvest diseases	1
5.3	Physiological disorder of post-harvest	1
5.4	Preventive measures of post-harvest physiological disorder	1
5.5	Post-harvest insect pest	1
5.6	Control measure of post-harvest insect pest	1
6	Packing House Operation	
6.1	Sorting, grading, sizing, cleaning and curing	1
6.2	Trimming, de-handling, waxing, chemical treatments and packaging	1
7	Packaging	
7.1	Design of packaging material and consideration in packaging.	1
8	Curing	
8.1	Principle and methods of curing	1
9	Storage	
9.1	Principles of storage	1
9.2	Factor affecting storage	1
9.3	Methods of storage	1
10	Post-harvest Quality	
10.1	Criteria of post-harvest quality	1
10.2	Judgement of post-harvest quality	1
11	Market	
11.1	Markets of horticultural produces	1
11.2	Marketing of horticultural produces	1
12	Preservations	
12.1	Principles of preservations	1
12.2	Methods of preservations	1

13	Commodity profile of major fruits, vegetables and cut flowers	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Identification of equipment, tools and chemicals used in post-harvest horticulture	1
2	Determination of Total Soluble Solids (TSS) and titratable acidity (TA)	1
3	Determination of physiological loss in weight (PLW) and spoilage loss	1
4	Artificial ripening of banana	1
5	Drying of vegetables	1
6	Preparation of potato chips	1
7	Preparation of tomato ketchup	1
8	Preparation of squash	1
9	Preparation of Jam	1
10	Preparation of pickles	1
11	Preparation of jelly and marmalade	1
12	Visit to markets, collection center packaging house and cold storage	1
13	Maturity judgment and harvesting of fruits/ vegetables/ ornamental crops	2
14	Organoleptic evaluation and hedonic rating	1
	Total	15

Recommended Reading Materials

1. Kader, A. A. (2002). *Post-harvest Technology of Horticultural Crops*. Post-harvest Technology Center, UC DAVIS Department of Plant Sciences.
2. Bautista, O.K. (1990). *Post-harvest Technology for Southeast Asian Perishable Crops*. University of the Philippines, Technology and Livelihood Resource Center, Philippines.
3. Gautam, D.M. and Bhattarai, D. R. (2012). *Post-harvest Horticulture*. Pabitra and Shanta. Bhawani Printers Chabahil Kathmandu, Nepal.
4. Sudheer, K. P. and Indira, V. (2007). *Post-Harvest Technology of Horticultural Crops*. New India Publishing.
5. Kays, S.J. (1998). *Post-harvest Physiology of Perishable Plant Products*. CBS Publisher and Distributors, New Delhi, India.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	ASC721
Course Title	Principle and Practices of Animal Breeding
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 basic principles and fundamentals of animal breeding and application of animal breeding techniques to improve the breeds of different species.
Course Description
Introduction, history and importance of animal breeding; Animal genetic resources and sustainable development of indigenous breeds; Importance of indigenous breed and economic values of cattle, buffalo, sheep, goat, pig, poultry and horse; Important economic traits of livestock and poultry; Variation and causes of variation; Importance of heredity and environment; Gene action (additive and non-additive); Concept of heritability and repeatability; Selection and mating system; Hormone and hormonal mechanism in growth, lactation and reproduction; Male and female reproductive system; Estrus, estrus detection, estrus cycle, estrus induction, estrus ovulation and synchronization. Artificial insemination (AI); Semen, method of semen collection, dilution, preservation and thawing; Synchronization and transfer of embryo and its importance; Embryo, embryo transfer, importance, techniques, super ovulation, collection, Transgenic animal and their production; Animal biotechnology and recent advances in animal biotechnology.

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1	Introduction, history and importance of animal breeding	1
2	Animal genetic resources and sustainable development of Nepal	1
3	Importance of indigenous breed and economic values of cattle, buffalo, sheep, goat, pig, poultry and horse	1
4	Important economic traits of livestock and poultry	1
5	Variation and causes of variation	2
6	Importance of heredity and environment	1

7	Gene action (additive and non-additive)	2
8	Concept of heritability and repeatability	2
9	Selection (principle, basis, method, selection parameters)	3
10	Mating system (inbreeding, out breeding)	2
11	Hormone and hormonal mechanism in growth, lactation and reproduction	2
12	Male and female reproductive system	1
13	Estrus, estrus detection, estrus cycle, estrus induction and estrus, ovulation, synchronization	3
14	Artificial insemination (AI): Introduction, advantages and limitation and techniques of AI	1
15	Semen, method of semen collection, dilution, preservation and thawing	2
16	Synchronization and transfer of embryo and its importance	1
17	Embryo, embryo transfer, importance, techniques, super ovulation, collection	2
18	Transgenic animal and their production	1
19	Animal biotechnology and recent advances in animal biotechnology	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Estimation of heritability	1
2	Estimation of repeatability	1
3	Estimation of variance components, means	1
4	Breeding value, PBA, MPPA	2
5	Calculation of inbreeding relationship and coefficient	1
6	Livestock farm data analysis and report writing	1
7	Estimation of selection parameters, selection index etc.	2
8	Heat detection in different farm animals	1
9	Palpation of female reproduction organ	1
10	Preparation of A. V.	1
11	Collection of semen and evaluation	1
12	Dilution and preservation of semen	1
13	Heat detection and semen thawing and insemination	1
	Total:	15

Recommended Reading Materials

1. Hafez, E.S.E. (1989). *Reproduction in Farm Animal - 5th edition*.
2. Nagabhushanam, R., Kodarkar, M.S. and Sarojini, S. (1999). *A Text Book of Animal Physiology 2nd ed.* Oxford and IBH Publishing Co. Pvt. Ltd. 66, Janpath, New Delhi.
3. Nicholl, D.S.T. (1994). *An Introduction to Genetic Engineering*. Cambridge, UK.
4. Prasad, J. (2016). *Animal Husbandry and Dairy Science (6th Edition)*. Kalyani Publishers, New Delhi India.
5. Sastry, N.R.S. and Thomas, C.K. (2018). *Livestock Production and Management (5th Edition)*. Kalyani Publication, New Delhi India.
6. Satisfury, G.W., M.L.Vandam-Mark and J.R. Lodge. (1988). *Physiology of Reproduction and Artificial Insemination of Cattle*. W. H. Freeman and Company Sanfrancisco, US.
7. Stickberger, M.W. (1985). *Genetics - 3rd edition*. MillanPubi., Co. USA.

FAR WESTERN UNIVERSITY
Faculty of Agriculture

Course Code	AEN721
Course Title	Principles and Practices of Irrigation
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course

The main objectives of this course are to provide basic knowledge and practices on scheduling and estimation of depth of irrigation to meet consumptive use in the cropped field, measure and apply required quantity of water by using different irrigations methods familiar with field drainage methods.

Course Description

Irrigation: introduction and history (Nepal); Water resource potential of Nepal; Soil water retention and movement; Determination of crop water requirement; Consumptive use of water; Irrigation methods and scheduling; Drainage

Course Breakdown (Theory)

SN	Course Outline	Lectures
1	Introduction; history of irrigation development in Nepal; Water resource potential for irrigation in Nepal	1
2	Role of irrigation in agriculture; Irrigation practices in Nepal	1
3	Soil-water-plant relationship with respect to irrigation	1
4	Soil water retention and movement: Infiltration, percolation, hydraulic conductivity, permeability, seepage and inflow	1
5	Soil moisture constants with numerical problems and calculations	1
6	Water requirements of crops: Methods of determination of crop water requirement	1
7	Water requirements of crops: Base period, irrigation intensity, command area; Duty of water and Delta	1
8	Water requirements of crops: Numerical problems and calculations	1
9	Consumptive Use: Consumptive use rate; Estimation of consumptive use by direct method	1
10	Consumptive Use: Estimation of consumptive use by empirical method: Modified Penman method, Blaney and Criddle method;	1

	Cirstiansen method	
11	Consumptive Use: Numerical problems and calculations	1
12	Irrigation scheduling: Objectives of irrigation scheduling; Soil moisture extraction pattern and moisture sensitive periods of crops	1
13	Irrigation scheduling: Depth and interval of irrigation; Indicators for irrigation scheduling	1
14	Irrigation scheduling: Numerical problems and calculations	1
15	Farm irrigation practices: Surface irrigation methods and its design	1
16	Farm irrigation practices: Sub-surface irrigation methods and their design	1
17	Farm irrigation practices: Drip and sprinkler irrigation method and their design; Other advanced and high-tech irrigation methods and their design	1
18	Hydroponics: Concept, technology, use and its feasibility	1
19	Efficiencies of irrigation water conveyance and application; Advance irrigation techniques	1
20	Water conveyance and distribution system: Layout of irrigation canals	1
21	Water conveyance and distribution system: Components of channel crossing structures and water control structures	1
22	Water conveyance and distribution system: Erosion control structures	1
23	Farm water measuring methods: Different methods available for measuring farm water	1
24	Farm water measuring methods: Numerical problems and calculations	1
25	Quality of irrigation water	1
26	Irrigation pumps: Centrifugal pumps, turbine pumps, propeller pumps	1
27	Characteristics of different types of pumps	1
28	Irrigation pumps: Numerical problems and calculations	1
29	Field drainage theory and methods: Water logging problem; types of drain	1
30	Methods of drain: Surface and sub-surface methods	1
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Measurements of soil moisture by using Tensiometer, moisture meter, gravimetric method and feel method	1
2	Determination of soil moisture potentials: Field capacity, permanent wilting point and saturation	1
3	Determination of infiltration capacity by using Double ring infiltrometer	1
4	Assessment to determine irrigation scheduling	1
5	Calculation of consumptive use by using empirical formulas: Modified Penman method and Blanney-Criddle method	1
6	Calculation of consumptive use by using empirical formulas: Blanney-Criddle method	1
7	Estimation of crop water requirement using CROPWAT software	1
8	Field evaluation of surface irrigation methods: Check basin, border strip and furrow	1
9	Assessment of field water losses, seepage, percolation and runoff	1
10	Evaluation of water application efficiencies and water distribution uniformity	1
11	Layout of drip and sub-surface irrigation methods	1
12	Designing of sprinkler irrigation system	1
13	Depth of Irrigation water measurement by using devices: Weir, Parshall-flume and orifices	1
14	Measurement of water flow capacity by using float method and volumetric method	1
15	Field visit to irrigation management project/ program	1
	Total	15

Recommended Reading Materials

1. Manandhar, B.D. (2016). *Laboratory Manual Principles and Practices of Farm Water Managemet*. Maitreya Agri-Engineering industry, Chitwan, Nepal.
2. Michael, A.M. (2008). *Irrigation Theory and Practices*. Vikash Publication House, New Delhi, India.
3. Modi, P.N. (2000). *Irrigation Water Resources and Water Power Engineering - IV edition*. Standard book house, New Delhi, India.
4. Punmia, B. C. and Pande, B.B. (1990). *Irrigation and water power engineering*. Standard Publisher Distribution, New Delhi, India.
5. Shankara-Reddi, G.N. and Yellamanda-Reddy, T. (1995). *Efficient use of Irrigation water*. Kalyani Publishers, New Delhi, India.

FAR WESTERN UNIVERSITY
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Course Code	AEX721
Course Title	Social Mobilization and Community Development
Credit Hours	3 (2+1)
Full Marks	75
Theory (Marks)	50
Practical (Marks)	25

Objective (s) of the Course
<p>This course will enable the student to select and apply the most appropriate process, approach and techniques in developing rural and community development program by appreciating the importance of socially organized groups and their mobilization in the development activities and will also empower the students to make wise on the use of gender concept and participatory learning tools related to development in most relevant ways.</p>
Course Description
<p>Concept of development, development indicators, dimension, theories, trends, approach and its characteristics; Concept principle and strategies of sustainable development; Community development: Concept, types, principle, characteristics and steps; Modernization, modern society; Relative deprivation and human poverty, poverty, poverty alleviation; Social mobilization; Decentralization for development: Practices, strategies and issues in Nepal; Gender: Concept and terminologies; Concept of migration, remittance use in agriculture, and gender implication of migration; Social mobilization: Concept, process, typologies, stage and challenges, history of social mobilization, participatory planning in social mobilization process, monitoring and evaluation of social mobilization, participatory learning and action tools for social mobilization.</p>

Course Breakdown (Theory)		
SN	Course Outline	Lectures
1	Concept of development: Development characteristics, indicators, dimension; Difference between change growth and the development	1
2	Overviews of development theories: Economic and non-economic theories of development	1
3	Overview of approach, trends and development practice of Nepal	1
4	Concept of modernization: Overview of modernization theory	1

	Rostow's model of economic development; Major process of change in modernization process	
5	Concept, principle and strategies of sustainable development	1
6	Concept of community and society: Basic characteristics of community; Community development: Process, methods, program and procedure; Guiding principle, type of community development program	1
7	Basic values of community development; Basic steps of community development	1
8	Relative deprivation, human poverty and human poverty index; Methods of calculating human poverty index and human development index	1
9	Concept and definition of decentralization and principle of subsidiary; Forms of decentralization, brief history of decentralization practice in Nepal	1
10	Overview of local government reforms and federalization in Nepal	1
11	Major characteristics of current decentralization practice of Nepal; Advantage, disadvantage, issues of decentralization practice in Nepal	1
12	Concept of sex and gender, gender stereotypes, gender roles and gender need; Social stratification and gender, gender based discrimination in Nepal; Concept of equity and equality	1
13	Gender analysis and guiding question, Gender analysis tools; Gender sensitive planning, Gender budgeting; Gender mainstreaming: Process and procedure, domains and level of change; GoN action for gender mainstreaming	1
14	Concept of social inclusion social inclusion mapping; BPFA, CEDAW, Gender and social inclusion strategies and action	1
15	Origin and concept of WID, WAD, GAD and its differences	1
16	Concept of migration, remittance, current migration and remittance status; Migration and its gender implication in development; Positive and negative consequences of migration in development	1
17	Social mobilization: Definition, concept and meaning; Transformational and transactional social mobilization; Social mobilization and social transformation process	1
18	Concept, meaning and purpose of social mobilization;	1

	Terminologies and typologies of social mobilization	
19	Conceptual and program package of social mobilization	1
20	Stage/phases/dialogue of social mobilization	1
21	Qualities of social mobilizer: Social mobilization brand; Social mobilization and good governance	1
22	Relationship of poverty alleviation and social mobilization	1
23	Participatory planning in social mobilization process; Principle and assumption of participatory planning; Major portfolio of planning	1
24	Major activities of program planning of social mobilization; Fundamental question preparation before planning step of planning cycle	1
25	Implementation process and procedure of social mobilization; Challenges and issues of implementation of social mobilization	1
26	Participatory learning and action tools for social mobilization; Concept of PRA, RRA, PLA and its use in development; Tools and techniques of PRA/ RRA used in social mobilization process	1
27	Discussion and interview: Focused group discussion, semi structured interview	1
28	Diagram and mapping: Resource mapping, Venn diagram, Social mapping, Mobility map, Daily activity profile, Problem solving tree, Seasonal calendar	1
29	Updates in concept of development, gender and decentralization (Teacher's Review)	2
	Total	30

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	A visit to DDC/ Municipality/ Rural municipality to study social mobilization processes	1
2	Study of resource mobilization/social mobilization guidelines of GoN	1
3	Case study of rural development/ community program implementing in Nepal	1
4	Sensitization of participatory learning and action tools for social mobilization	1
5	Tools and techniques of PRA/RRA used in social mobilization process and selection of appropriate tools of participatory learning and action	1

6	Conduct transect walk and night halt in a community and prepare a report	1
7	Conduct Wealth being ranking and Focused group discussion	1
8	Exercise on calculation of HPI, HDI, GDI, GEI based on CBS's current data	1
9	Conduct Resource mapping, Venn diagram and social mapping	1
10	Conduct Priority matrix, problems matrix and direct matrix ranking	1
11	Conduct FGD and prepare Problem tree/ problem solving tree	
12	Conduct stakeholders analysis with response to implement any community development program	1
13	Preparation of Venn diagram and Institution mapping	1
14	Conduct gender analysis by using any gender analysis tools	1
15	Role play and sharing experience (Let's change our gender role for a day)	1
	Total	15

Recommended Reading Materials

1. Chambers, R. (2016). *Revolution in Development Enquiry (Nepal edition)*. Earthscan, New York, US.
2. Khan, S. S. and Sah, J.S. (2001). *Social Mobilization Manual based on Synaja Experiences*. Social Mobilization Experimentation and Learning Center, Nepal.
3. MoLD. (2011). *Village Development Committee: Social Mobilization Guideline 2068*. Ministry of Local Development, Government of Nepal, Kathmandu, Nepal.
4. UNDP. (2001). *Governance and Poverty Reduction*. NHDR, Kathmandu, Nepal.

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Course Code	AEC701
Course Title	Economics of Crop and Animal Production
Credit Hours	0+1
Full Marks	25
Theory (Marks)	00
Practical (Marks)	25

Objective (s) of the Course
To equip students with the knowledge of economic and financial analysis of crop and livestock enterprises.
Course Description
Link commodity-based entrepreneurship learning with economic/financial analysis; Learning of production economics involved in at least one each of the agronomical crops, horticultural crops and livestock animals. This course will be linked with “Agri-Enterprise Development” courses offered by Agronomy, Horticulture and Animal Science Division. Students (single or a group of students) will be offered this course from 5 th to 7 th semester as per their selected “Agri-Enterprise Development” course. In the three semester, all the students will get a chance to analyze the economics of agronomical crop production, horticultural crop production and animal production. The course will be completed only when all the three project reports are submitted.

Course Breakdown (Practical)		
SN	Course Outline	Lectures
1	Preparation of Enterprise Budget	1
2	Preparation of detail Business Plan 2.1. Business Analysis and Production Plan 2.2. Business Management Plan 2.3. Business Development Plan 2.4. Financial Analysis and Funding Plan 2.5. Market and Competitive Analysis and Marketing Plan/Strategy	5
3	Detail recording of different financial data during the production process (including recording of any deviations from the initial plan) based on prepared protocol 1.1. Agronomical Crops	3

	1.2. Horticultural Crops 1.3. Livestock Animals	
4	Preparation of different physical/financial records based on field data 1.1. Agronomical Crops 1.2. Horticultural Crops 1.3. Livestock Animals	3
5	Analysis of Benefit-Cost Ratio, Net Present Value, Payback Period and Internal Rate of Return of the Firm based on simulation of recorded data for at least 10 years period with due consideration for market price index (inflation)	1
6	Analysis of sensitivity of the selected enterprise based on recorded data and possible changes in market scenario (cost of inputs and price of outputs), including analysis of extreme scenarios	1
7	Analysis of different physical and financial ratios to calculate the economics of production of agricultural commodity under consideration	1
Total		15

Recommended Reading Materials

1. FAO. (2018). *Seeds Toolkit - Module 1: Development of small-scale seed enterprises*. The Food and Agriculture Organization of the United Nations, Italy.
2. GoN and ADB. (2017). *Agribusiness Grant Facility Guideline 2072*. Raising Incomes of Small and Medium Farmers Project, Government of Nepal and Asian Development Bank, Nepal.
3. Johl, S. S. and Kapur, T. R. (2015). *Fundamentals of Farm Business Management*. Kalyani Publishers, India.
4. Khan, M. Y. and Jain, P. K. (2014). *Financial Management - Text, Problems and Cases*. Mc Graw Hill, India.
5. Subba-Reddy, Raghu Ram, S., P., Sastry, T. V. N. and Devi, I. B. (2019). *Agricultural Economics*. Oxford and IBH Publishing Co. Pvt. Ltd., India.

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Course Code	AED501 / AED601 / AED701
Course Title	Agri-Enterprise Learning and Development
Credit Hours	0+1
Full Marks	25
Theory (Marks)	00
Practical (Marks)	25

Objective (s) of the Course

Upon completion of this course, students will be able to thoroughly understand the practical aspect of crop and animal husbandry by directly engaging in the commercial production of selected crop and livestock enterprises. This will not only help them learn the biological processes of crop and livestock production, but also help them learn the monetary expenses involved as well as possible profits from these enterprises. This will, ultimately, encourage students for entrepreneurship development by taking up crop/ livestock enterprises after their graduation.

Execution Modality

Each student of 5th, 6th and 7th semester is required to engage in the direct production of selected agronomical crops, horticultural crops and livestock animals (including aquaculture) under the activities of Agri-Enterprise Learning and Development. However, in each semester, a student will be engaged in any one enterprise only and the remaining two enterprises will be taken up in the next semesters. So, in each semester only around one-third of the students are allowed to take up enterprises related to (i) agronomical crops, (ii) horticultural crops or (iii) livestock animals, including fish. Thus, by the end of 7th semester all students shall have been engaged in the production of selected agronomical and horticultural crops as well as selected livestock animals (or fish).

For taking up each of these enterprises, students will be divided into several groups of 5-10 students. Each group of students will be provided a certain amount of revolving fund to take up the enterprise offered by three divisions/units (i) Agronomy, (ii) Horticulture and (iii) Animal Science and Aquaculture. The original amount of funds spent in the project needs to be returned to faculty after completion of the project as a seed money. The enterprise to be taken up will be offered by respective divisions/units. Under the guidance of designated faculty

member, the students will carry out day-to-day activities to successfully grow the selected crops or raise the selected livestock animals/fishes. The students will also record all the financial transactions done throughout this period. The profits from these activities will be equally shared between the students. In case of losses, students should formally write to the designated authority explaining in detail about the reason for losses, approved by the designated faculty member. A team will be prepared to investigate such cases and upon its recommendation such losses could be exempted for paying back.