DAV UNIVERSITY, JALANDHAR

FACULTY OF AGRICULTURAL SCIENCES

COURSE CURRICULUM

FOR

B.Sc. (Hons.)AGRICULTURE

(4 Years Course)

1st to 8th SEMESTER

Examinations 2016–2017session

Syllabi applicable for admissions in 2016

DAV UNIVERSITY, JALANDHAR

Scheme of Courses B.Sc (Hons.) Agriculture
Semester 1

S. No	Paper Code	Course Title	L	T	P	Cr
1	AGR 106	Principles of Genetics	2	0	2	3
2	AGR 107	Principles of Agricultural Economics	2	0	0	2
3	AGR 113	Introduction to Soil Science	2	0	2	3
4	AGR 114	Fundamentals of soil water conservation and engineering	2	0	2	3
5	AGR 115	Plant Pathogens and Principles of Plant Pathology	3	0	2	4
6	AGR117	Fundamentals of Agriculture, Agronomy and Agricultural Meteorology	3	0	2	4
7	AGR 118	Introductory Nematology	1	0	2	2

L: Lectures T: Tutorial P: Practical Cr: Credits

Semester 2

S. No	Paper Code	Course Title	L	T	P	Cr
1	AGR 122	Water management including micro irrigation	2	0	1	3
2	AGR 123	Principles of Seed Technology	2	0	1	3
3	AGR125	Dimensions of Agriculture Extension	1	0	1	2
4	AGR 126	Agricultural Microbiology	2	0	1	3
5	AGR 127	Soil Chemistry, Soil Fertility and Nutrient Management	2	0	1	3
6	AGR 129	Principles of Agril. Extension and Agril. Economics	3	0	1	4
7	CSA 159	Introduction to computer application	1	0	1	2
8	ENG153A	Comprehension and Communication Skills in English	3	0	1	4

L: Lectures T: Tutorial P: Practical Cr: Credits

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Scheme of Courses B.Sc (Hons.) Agriculture
Semester 3

S. No	Paper Code	Course Title	L	T	P	Cr
1	AEC 211	Agricultural Finance and Co-operation	1	0	1	2
2	AGR 211	Field Crops-I (Kharif)	2	0	1	3
3	AGR 212	Principles of Plant Breeding	2	0	1	3
4	AGR 213	Insect Morphology and Systematics	2	0	1	3
5	AGR 215	Production Technology of Vegetables & Flowers	2	0	1	3
6	AGR 216	Livestock Production and Management	2	0	1	3
7	AGR 217	Organic Farming	2	0	1	3
8	AGR 218	Crop Physiology	2	0	1	3

L: Lectures T: Tutorial P: Practical Cr: Credits

Semester 4

S. No	Paper Code	Course Title	L	T	P	Cr
1	AGR 214	Farm power and machinery	1	0	1	2
2	AEC 221	Agricultural marketing, Trade and Prices	1	0	1	2
3	AGR 221	Field crops-II (Rabi)	2	0	1	3
4	AGR 222	Manures, Fertilizers and Agrochemicals	2	0	1	3
5	AGR 223	Insect Ecology & Integrated pest management including beneficial insects	2	0	1	3
6	AGR 224	Protected cultivation and Post-harvest Technology	1	0	1	2
7	AGR 225	Diseases of Field Crops and their management	2	0	1	3
8	AGR 226	Production technology of spices, Aromatics Medicinal and Plantation crops	2	0	1	3

L: Lectures T: Tutorial P: Practical Cr: Credits

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Scheme of Courses B.Sc (Hons.) Agriculture
Semester 5

S. No	Paper Code	Course Title	L	T	P	Cr
1.	AGR 310	Production technology of fruit crops	2	0	1	3
2.	AGR 311A	Farming Systems and Sustainable Agriculture	1	0	1	3
3.	AGR 312A	Principles of Plant Biotechnology	2	0	1	3
4.	AGR 313	Crop Pests and stored grain pests and their management	2	0	1	3
5.	AGR 314	Fundamentals of Agri Business Management (Including product development, Appraisal and Monitoring)	1	0	1	2
6.	AGR 315A	Practical crop production I (Cereals, Pulses and Fodder crops)	0	0	4	2
7.	AGR 316	Fundamentals of Rural Sociology and Educational Psychology	2	0	0	2
8.	AGR 317	Post-harvest management and value addition of fruits and vegetables	1	0	1	3
9.	AGR 319	Breeding of Field / Horticultural crops	2	0	1	3

L: Lectures T: Tutorial P: Practical Cr: Credits

Scheme of Courses B.Sc (Hons.) Agriculture
Semester 6

S. No	Paper Code	Course Title	L	T	P	Cr
1	AGR 321	Production Economics & Farm management	1	1	1	2
2	AGR 322	Extension Methodologies for Transfer of Agricultural Technology	1	1	1	2
3	AGR323	Biochemistry	2	0	1	3
4	AGR 324A	Practical crop production II (oil seeds & commercial crops)	0	1	2	2
5	AGR 325	Weed management	1	0	1	2
6	AGR 326	Renewable Energy	1	0	1	2
7	AGR 327	Entrepreneurship Development	1	0	1	2
8	AGR 328	Disease of Horticultural crops and their management	2	0	1	3
9	EVS 151	Environmental Science	2	0	1	3

L: Lectures T: Tutorial P: Practical Cr: Credits

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Scheme of Courses B.Sc (Hons.) Agriculture
Semester 7

	Courses for Experiential Learning	20

Courses for Experiential Learning: A student has to register minimum of 20 credits with major load in one area of electives and rest from among one / two areas of electives in the seventh semester.

Sr.	Title of the module	Credits
I	**Crop Production**	
1	Integrated Farming System	3(1+2)
2	Soil Management (conservation Problematic soil, Soil	4(1+3)
3	Seed Production Technology	3(1+2)
4	Remote Sensing GIS and Land use Planning	3(1+2)
5	Water Management (Watershed Micro-irrigation	4(1+3)
II	**Crop Protection**	
1	IPM and IDM (Pest Disease Scouting)	4(2+2)
2	Management of Post-Harvest insect- pests and diseases	3(1+2)
3	Non-insect pests and their Management	3(1+2)
4	Apiculture	2(0+2)
5	Mushroom (cultivation)	2(0+2)
6	Bio-control agencies and bio-pesticide (mass	3(1+2)
7	Pesticides and Plant Protection equipment	3(1+2)
8	Disease of Horticultural crops and their management	3(2+1)
III	**Horticulture**	
1	Commercial Vegetable Production	3(1+2)
2	Commercial Floriculture	3(1+2)
3	Commercial Fruit Production	3(1+2)
4	Nursery management of horticultural crops	4 (1+3)
5	Protected cultivation of horticultural crops and Seed production of	4(1+3)
6	Processing and value addition of horticultural crops	3(1+2)
IV	**Post Harvest Technology and Value addition**	
1	Post harvest Technology of Horticultural crops	3(1+2)
2	Unit operation for quality value addition processing and development of	4(1+3)
3	Post harvest technology of spices, plantation crops, medicinal and	4(1+3)
4	Integrated storage management of fruits, flowers and	3(1+2)
5	Post harvest handling of cut flowers and dry flowers	3(1+2)
6	Processing of cereals, pulses and oilseed crops including	3(1+2)
7	Dairy Products Technology	3(2+1)
V	**Agri-Business Management**	
1	Information & Communication Management	3 (1+2)
2	Management of Agro-based industry	4 (1+3)
3	Marketing Management (Agricultural Import-Export Policy of Govt. of India &	3 (1+2)
4	Financial Management of Agri-Business	4 (1+3)

5	Natural Resources Economics and Management	3 (1+2)
6	Project formulation, Evaluation and Monitoring	3 (1+2)
VI	**Social Sciences**	
1	Agricultural Journalism	3 (1+2)
2	Visuals and Graphic Communications	3 (1+2)
3	Cyber Extension	2 (1+1)
4	Behavioral Skills	3 (1+2)
5	Livestock, Poultry and Fish Marketing	3 (1+2)
6	Farm Planning and Budgeting	3 (1+2)
7	Government Policies and Programmes Related to	3 (1+2)
8	Milk Processing	3(2+1)
VII	**Basic Sciences**	
1	Molecular Breeding	3 (1+2)
2	Plant tissue culture	4 (1+3)
3	Recombinant DNA Technology	3 (1+2)
4	Bio informatics	3 (1+2)
5	Microbial & Environmental Technology	4 (1+3)
6	Molecular Diagnostics	3(1+2)
VIII	**Commercial Agriculture**	
1	Commercial floriculture	3 (0+3)
2	Commercial fruit production	3 (0+3)
3	Nursery management of horticultural crops	3 (1+2)
4	Cultivation of commercially important medicinal &	2 (1+1)
5	Commercial spices production	3 (1+2)
6	Production technology of economic forest plants	3 (1+2)
7	Commercial seed production technologies	3 (1+2)

DAVU will offer courses as per facilities available

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Scheme of Courses B.Sc (Hons.) Agriculture
Semester 8

Rural Agricultural Work Experience (RAWE)- INTERNSHIP

S. No	Paper Code	Course Title	L	T	P	Cr
1	AGR 421	Crop Production	0	1	10	5
2	AGR 422	Crop Protection	0	1	8	4
3	AGR 423	Rural Economics	0	1	6	3
4	AGR 424	Extension Programme	0	1	8	4
5	AGR 425	Research Station / KVK / DAATT Centre activities and Attachment to the Agro-based industries	0	1	8	4

L: Lectures T: Tutorial P: Practical Cr: Credits

Rural Agricultural Work Experience (RAWE): Under this programme DAVU will follow the following Model:

S. No.	RAWE Model	Duration(Week)
1	Orientation	1
2	Village attachment	7
3	Agri-clinics/Plant Health Clinics/Experiential learning/ Industrial Attachment	1 4
4	Project report preparation and examination	2

1. Orientation

In this introductory lectures by faculty and guest lectures in each discipline: Agriculture Biotechnology, Agriculture Economics, Agriculture Engineering, Agriculture Extension, Agronomy, Entomology, Fruit Science, Plant Breeding, Plant Pathology, Post Harvest technology, Soil Science, Vegetable Science will be conducted.

2.Village attachment

- The students will be attached to progressive farmers of thenearby villages
- Arrangement of various inputs like seeds/seedlings and fertilizers
- Information will be collected on the basis of following:
    - Crop Protection
    - Crop Production
    - Extension programme
    - Economics

3. Experiential learning:

- Small demonstration plots of different vegetables/flowers, nursery management, mushroom, liquid manure, phospho- compost will be demonstrated
- Visit of students to different Universities/ Institutes/Industries will be conducted
- If any student is willing for Industrial training, she/he can be allowed to undergo the

same at his own expenses with prior permission during the semester break

- Training regarding mushroom cultivation/apiculture/organic farming will be conducted

4. Evaluation:

The evaluation will be done on the basis of field work, project report and viva- voce examination

Minimum attendance for this programmme- 85%

Records: Students shall complete the record work based on daily field observations note books and weekly diaries maintained by them.

Evaluation Procedure: The students shall be evaluated by Course Coordinators.

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SYLLABUS

AGRONOMY

Paper Code	Course Title	L	T	P	Cr
AGR 117	Fundamentals of Agriculture, Agronomy and Agricultural Meteorology	3	0	2	4

UNIT I

Evolution of agriculture, History of Agricultural Development; Ancient India Agriculture in Civilization Era, Chronological Agricultural Technology development in India.Agronomy as a science and its relationships with other sciences. Classification of crops. Crop rotation: principles, limitation, advantages. Rotational intensity, cropping scheme, cropping intensity.

UNIT II

Cropping system- intercropping, mixed cropping, multiple cropping and relay cropping Germination, Maturity, Harvesting and Storage of crop plants. Tillage principles and requirement of minimum tillage.

UNIT III

Seed bed preparation. Characteristics of good seed beds. Methods of sowing and their suitability under different conditions. Seedling practices in relation to kind of seed, time of sowing, soil moisture. Tillage- practices for different soil types and crops.

UNIT IV

Weed characteristics, dissemination, and competition for growth factors and problems caused by them. Common methods of weed control and losses. Green manuring: advantages, limitations, green manure crops.

Practical

Land measurement, Identification and practices in the use of farm hand tools, bullock and tractor driven implements. Identification of crop seeds, crop plant and important weeds. Collection, weeding, hoeing in various crops. Installation and use of various meteorological instruments for measurement of different weather parameters. Study the principle and working of various meteorological instruments. Study of wind direction and climatic water balance.

Measurement & significance of atmospheric humidity, rain fall and evaporation over an area. Interpretation of climatic data in relation to crop weather relationship.

Study of climatic requirement of important different crops & their distribution and yield in India

Suggested Readings:-

Reddy S.R., Principles of Crop Husbandry, Kalyani Publishers, Ludhiana, 2009.
Handbook of Agriculture, I.C.A.R. Publications, New Delhi, 2008.
Weeds of North India I.C.A.R. Publications, New Delhi, 2008.
Package of Practices for *Rabi* and *kharif* crops, P.A.U. Publications Ludhiana, Corresponding year.

Paper Code	Course Title	L	T	P	Cr
AGR 122	Water management including micro irrigation	2	0	2	3

UNIT I

Irrigation: definition and objectives, water resources and irrigation development in India; Infiltration, percolation, movement of water on soil.

UNIT II

Soil plant water relationships; Methods of soil moisture estimation, evapotranspiration; Soil water energy concepts, Irrigation water quality and its management.

UNIT III

Methods of irrigation: surface, sprinkler and drip irrigation; Irrigation efficiency and water use efficiency, conjunctive use of water, irrigation water quality and its management.

UNIT IV

Scheduling of irrigation; Water management of different crops and crop water requirement (rice, wheat, maize, groundnut, sugarcane, mango, banana and tomato); Agricultural drainage.

Practical: Determination of bulk density by field method; Determination of soil moisture content by gravimetric method, tensiometer. Determination of field capacity by field method; Determination of permanent wilting point; Calculation of irrigation water requirement (Problems); Demonstration of check basin and basin method of irrigation; Visit to farmers field and cost estimation of drip irrigation system; Demonstration of filter cleaning, fertigation, injection and flushing of laterals; Erection and operation of sprinkler irrigation system; Measurement of emitter discharge rate, wetted diameter and calculation of emitter discharge variability.

Suggested Readings:

Iraeslon, Irrigation Principles, John Willey & Sons New Delhi 1996.
Gandhi R T., Gupta, P.C., Joseph, A.P. and Rage, N. I, Handbook of Irrigation Water Management.
Mickael, A.M., Irrigation Theory and Practices.

Paper Code	Course Title	L	T	P	Cr
AGR 211	Field Crops-I (*Kharif*)	2	0	2	3

UNIT I

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of kharif crops. Cereals – rice, maize, sorghum, pearl millet and minor millets.

UNIT II

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of pulse crops: pigeonpea, mungbean and urdbean.

UNIT III

Origin, geographic distribution, economic importance, soil and climatic requirement,

varieties, cultural practices and yield of Oilseeds: groundnut, sunflower and soybean.

UNIT IV

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of Fibre crops: cotton and Forage crops: cowpea and napier.

Practical: Crop identification based on seed and morphological characteristics. Different inorganic fertilizers, fertilizers recommendation for *Kharif* crops and calculating the fertilizer requirement of various crops as per the recommendation using different combinations. Practice in different methods of fertilizer application. Sowing of important *kharif* crops. Identification of *kharif* weeds and chemical method of weed control. Visit to different farms. Study of morphological characteristics of rice, maize, bajra, groundnut and cotton.

Suggested Readings:-

Reddy S.R., Principles of Crop Husbandry, Kalyani Publishers, Ludhiana, 2009.
Handbook of Agriculture, I.C.A.R. Publications, New Delhi, 2008.
Weeds of North India I.C.A.R. Publications, New Delhi, 2008.
Package of Practices for kharif crops, P.A.U. Publications Ludhiana, Corresponding year.
Walia, U.S., Walia, S.S., Kler, D.S. and Singh Dalip, Science of Agronomy, Scientific Publishers, 2013

Paper Code	Course Title	L	T	P	Cr
AGR 217	Organic Farming	2	0	2	3

UNIT I

Introduction, concept, relevance in present context; Organic production requirements; Influence of OM on Soil Properties, plant growth and environment.

UNIT II

Biological intensive nutrient management-organic manures, vermicomposting, green manuring, concentrated manures and biofertilizers; recycling of organic residues.

UNIT III

Soil improvement and amendments; Integrated diseases and pest management – use of biocontrol agents, bio pesticides pheromones, trap crops, bird perches; Weed management;

UNIT IV

Quality considerations, certification, labeling and accreditation processors, marketing, exports.

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

Suggested Readings:

Sharma, A.K. 2005. Biofertilizers for Sustainable Agriculture. Agrobios (India), Jodhpur.
Alexander, M. 1961. Introduction to Soil Microbiology John Wiley & Sons, Inc., New York
Kannaiyan S. Kumar, K & Govindarajan K. 2004. Biofertilizers Technology. Scientific Publ.
Gaur, A.C. 2006. Biofertilizers in Sustainable Agriculture. ICAR, New Delhi.

Paper Code	Course Title	L	T	P	Cr
AGR 221	Field crops-II (*Rabi*)	2	0	2	3

UNIT I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops; Cereals: wheat and barley

UNIT II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Pulses: chickpea, lentil, peas and French bean

UNIT III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Oilseeds: rapeseed and mustard, safflower and linseed;

UNIT IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Sugar crops: sugarcane and sugar beet: Forage crops: berseem, Lucerne and oat.

Practical: Crop identification based on seed and morphological characteristics
Different inorganic fertilizers, fertilizers recommendation for Rabi crops and calculating the fertilizer requirement of various crops as per the recommendation using different combinations. Different methods of fertilizer application used in Rabi crop. Sowing of important Rabi crops. Identification of Rabi weeds and chemical method of weed control Study of morphological characteristics of important Rabi crops. Visit to different farms

Suggested Readings:-

Reddy S.R., Principles of Crop Husbandry, Kalyani Publishers, Ludhiana, 2009.
Handbook of Agriculture, I.C.A.R. Publications, New Delhi, 2008.
Weeds of North India I.C.A.R. Publications, New Delhi, 2008.
Package of Practices for Rabi crops, P.A.U. Publications Ludhiana, Corresponding year.
Walia, U.S., Walia, S.S., Kler, D.S. and Singh Dalip, Science of Agronomy, Scientific Publishers, 2013

Paper Code	Course Title	L	T	P	Cr
AGR 311	Farming Systems and Sustainable Agriculture	1	0	2	2

UNIT I

Sustainable agriculture: Introduction, definition, goal and current concepts, factors affecting ecological balance and ameliorative measures;

UNIT II

Land degradation and conservators of natural resources, LEIA & HEIA;

UNIT III

Irrigation problems, waste lands and their development; Organic farming: definition, principles and components;

UNIT IV

Farming systems: definition, principles and components, IFS models for wetland, irrigated dryland and dryland situations.

Practical: Preparation of cropping scheme for irrigated situations; Preparation of cropping scheme for dryland situations; Study of existing farming systems in nearby villages; Preparation of integrated farming system model for wetlands; Preparation of integrated farming system model for drylands.

Suggested Readings:-

Walia, U.S., Walia, S.S., Kler, D.S. and Singh Dalip, Science of Agronomy, Scientific Publishers, 2013

Reddy S.R., Principles of Crop Husbandry, Kalyani Publishers, Ludhiana, 2009.

Paper Code	Course Title	L	T	P	Cr
AGR 315	Practical crop production I (Cereals, Pulses and Fodder crops)	0	0	2	1

UNIT I

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed treatment, nursery raising, sowing,

UNIT II

Nutrient management, water management, weed management and management of insect pests and diseases of crops.

UNIT III

Harvesting, threshing, drying, winnowing, storage and marketing of produce.

UNIT IV

Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students.

Paper Code	Course Title	L	T	P	Cr
AGR 324A	Practical crop production II (oil seeds & commercial crops)	0	0	2	1

UNIT I

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed treatment, nursery raising, sowing,

UNIT II

Nutrient management, water management, weed management and management of insect-pests and diseases of crops

UNIT III

Harvesting, threshing, drying, winnowing, storage and marketing of produce.

UNIT IV

Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students.

Paper Code	Course Title	L	T	P	Cr
AGR 325	Weed management	1	0	2	2

UNIT I

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination; Weed biology and ecology, crop weed association, crop weed competition and allelopathy Concepts of weed prevention, control and eradication;

UNIT II

Methods of weed control: physical, cultural, chemical and biological methods, Integrated weed management; Herbicides: advantages and limitation of herbicide usage in India,

UNIT III

Herbicide classification, formulations, methods of application; Introduction to Adjuvants and their use in herbicides; Introduction to selectivity of herbicides; Compatibility of herbicides with other agro chemicals;

UNIT IV

Weed management in major field and horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

Practical: Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of herbarium of weeds; Calculations on weed control efficiency and weed index; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Tours and visits of problem areas.

Suggested Readings:

Aldrich, R.J., Kramer, R.J. 1997. Principles in Weed Management. Panima publ.
Ashton, F.M and Crafts, A.S. 1981. Mode of Action of Herbicides (2nd Ed). Wiley Inter Science.
Gupta,O.P. 2007. Weed Management – Principles and Practices. Agrobios
Mandal, R. C, 1990. Weed, Weedicides and Weed Control – Principles and Practices. Agro – Botanical Publ.
Rao, V.S. 2000. Principles of Weed Science. Oxford & IBH
Subramanian, S. Ali, A.M and Kumar, RJ. 1997. All about Weed Control. Kalyani
Zimdahl RL. 1999. Fundamentals of Weed Science (2nd Ed). Academic Press.

Paper Code	Course Title	L	T	P	Cr
AGR 411	Integrated Farming System	1	0	2	3

UNIT I

Farming system: Definition, scope and characteristics, classification, historical development of Farming system's in India under different situations. Concept and component of farming system and its interaction between components.

UNIT II

Cropping system: Complementary and competitive interaction, effect of preceding crops and associated crops, indices for evaluation of cropping system, agronomic requirements in managements of cropping system,

UNIT III

Cropping scheme and sustainable agriculture: Definition and objects of cropping scheme, principal or characteristics of a good cropping scheme, definition of sustainable agriculture and role of farming system in sustainable agriculture.

UNIT IV

Integrated farming system (IFS): Importance of IFS, factors governing choice and size of enterprises and resource allocation in IFS, models of IFSs for irrigated coastal ecosystems and rainfed ecosystem. Importance and role of IFS's in organic farming, low input sustainable agriculture and low cost agricultural technologies.

Practicals: Preparation of cropping system for different farming situations having varying resources availability. Preparation of crop calendar for working out input requirements. Case studies on Integrated Farming System and development of IFS for different resource situations. Visit to different units of IFS.

Suggested Readings:

Reddy, G.H. Shankara and Reddy Yellamanda. Principles of Agronomy, Kalyani Publishers, 4th Edition, (2015)

Chandrasekaran, B., Annadurai, K. and Somasundaram, E. A Textbook of Agronomy by Publishers 4835/24, Ansari road, Daryaganj, New Delhi - 110002 Visit us at www.newagepublishers.com

Rana, S.S. Organic Farming. Department of Agronomy, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidhyalaya, Palampur-176062, Copyright 2011.

Rao, V. Praveen, Veeraghavaiah, R.V. Hemalatha, S. and Joseph, B. Farming System and Sustainable Agriculture.

DAV UNIVERSITY, JALANDHAR

GENETICS AND PLANT BREEDING

Paper Code	Course Title	L	T	P	Cr
AGR 106	Principles of Genetics	2	0	2	3

UNIT I

Mendelian genetics: extension and exceptions to the Mendelian laws. Multiple alleles and Multiple factor hypothesis. Pleiotropism, Penetrance and expressivity. Quantitative and Qualitative traits and differences between them. Sex linked inheritance.

UNIT II

Ultra structure of cell and cell organelles and their functions. Mitosis and meiosis, their significance and differences between them. Cytoplasmic inheritance: its characteristic features and difference between chromosomal and cytoplasmic inheritance.

UNIT III

Study of chromosome structure, morphology, number and types, Karyotype and Idiogram. Numerical chromosomal aberrations (Polyploidy) and Structural chromosomal aberrations and their role in evolution of different crop species like Cotton, Wheat, Tobacco, Triticale and Brassicas. Crossing over and factors affecting it, Mechanism of crossing over and Cytological proof of crossing over. Linkage, Types of linkage and estimation of linkage.

UNIT IV

DNA and its structure, function, types, modes of DNA replication and DNA repair. RNA and its structure, function and types. Gene expression and its regulation; Lac operon and Fine structure of Gene. Genetic code, Transcription and Translation. Mutation and its characteristic features, Methods of inducing mutations and CIB technique.

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

Suggested Readings: Fundamentals of Genetics by Singh, B.D., Kalyani Publishers.
Principles of Genetics by Gardner, E.J., John Wiley and Sons.
Instant Notes; Genetics by P.C. Winter, G.I. Hickey and H.L. Fletcher, BIOS Publications.
Molecular Biology of the Cell by Bruce Albertset. al., Garland Science.
Genetics A conceptual Approach by Benjamin A. Pierce, Freeman Publications.
Concept of Genetics by Klug, Cummings, Spencer and Palladino, Pearson publications.

Paper Code	Course Title	L	T	P	Cr
AGR 123	Principles of Seed Technology	2	0	2	3

UNIT I

Introduction to seed production, Importance of Seed Production, Seed Policy, Seed Demand forecasting and planning for certified, foundation and breeder seed production, deterioration of

crop varieties, Factors affecting deterioration and their control; Maintenance of genetic purity during seed production, seed quality; Different classes of seed, production of nucleus & breeder's seed, Maintenance and multiplication of pre-release and newly released varieties in self and cross-pollinated crops

UNIT II

Seed Production, Foundation and certified seed production in self pollinated and cross pollinated crops, Seed certification; Seed Act and Seed Act enforcement, Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed testing Laboratories; Duties and powers of seed inspectors, offences and penalties;

UNIT III

Seed control order and other issues related to seed quality regulation, Intellectual Property Rights, Patenting, WTO, Plant Breeders Rights, Varietal Identification through grow-out test and Electrophoresis; Seed Drying; Selection of seed dryers and systems of heated air drying, recommended temperature and depth of the seeds, management of seed drying

UNIT IV

Seed processing plant- Planning, layout, establishment of seed processing plant, Seed Processing; Seed testing procedures of quality assessment, Seed treatment, seed packing and seed storage, General principles of seed storage, constructional features of good seed warehouse, measures for pest and disease control, temperature control, Seed marketing, marketing structure, marketing organization, sales generation activities, promotional media, pricing policy; Factors affecting seed marketing.

Practical: Seed sampling principles and procedures; Physical Purity analysis, Germination analysis, Moisture tests, Viability test of field and horticultural crops, Seed health test, Vigour tests, Seed dormancy and breaking methods; Grow Out tests for varietal identification; Visit to seed Production plots, Seed processing Plants, Seed Testing Laboratories, Varietal identification in seed production plots; Planting ratios, isolation distance, rouging etc.

Suggested Readings:

Bhale, M.S. and Dhirendra, Khare, Seed Technology, Scientific Publishers, 2014
McDonald, M.B., Seed Sceince and Technology, Scientific Publishers, 2014.
Subir Sen and Nabinanda Ghosh, Seed Science and Technology, Kalyani Publishers, 2001
Singh, B.D., Plant Breeding, Kalyani Publishers, New Delhi, 2009.
Poehlman, J.N. and Borthakur, D.N, Breeding Asian Field Crops, Oxford and IBH Pub. Co., New Delhi, 2000.
Singh, P., Essentials of plant breeding, Kalyani Publishers, New Delhi, 2009.

Paper Code	Course Title	L	T	P	Cr
AGR 212	Principles of Plant Breeding	2	0	2	3

UNIT I

Classification of plants; Botanical description, Floral biology, Emasculation and Pollination techniques in cereals, millets, pulses, oil seeds, fibres, plantation crops etc. Aims and objectives of Plant Breeding; Modes of reproduction, Sexual, Asexual, Apomixis and their classification; Significance in plant breeding

UNIT II

Modes of pollination, genetic consequences, differences between self and cross pollinated crops, Methods of breeding-introduction and acclimatization; Mass selection, Johannson's pure line theory, genetic basis, pure line selection, Hybridization, Aims and objectives, types of hybridization;

UNIT III

Methods of handling of segregating generations, pedigree method , bulk method, back cross method and various modified methods; Incompatibility and male sterility and their utilization of crop improvement; Heterosis inbreeding depression, various theories of heterosis, exploitation of hybrid vigour, development of inbred lines, single cross and double cross hybrids;

UNIT IV

Population improvement programmes, recurrent selection, synthetics and composites; Methods of breeding for vegetatively propagated crops; Clonal selection; Mutation breeding; Ploidy breeding; Wide hybridization, significance in crop improvement.

Practical: Botanical description and floral biology; Study of megasporogenesis and microsporogenesis; Fertilization and life cycle of an angiospermic plant; Demonstration of mode of pollination; Plant Breeder's kit; Hybridization techniques and precautions to be taken; Floral morphology, selfing, emasculation and crossing techniques; Study of male sterility and incomparability in field plots; Rice and Sorghum, Maize & Wheat, Bajra & Ragi; Sugarcane; Groundnut, Safflower and Sesame; Redgram, Horse gram, Kidney bean, Chillies, Brinjal and Tomato

Suggested Readings:

Allard, R.W., Principles of Plant Breeding, John Wiley & Sons, New York, 1999.
Singh, B.D., Plant Breeding: Principles and Methods, Kalyani Publishers, New Delhi, 2009.
Poehlman, J.N. and Borthakur, D.N, Breeding Asian Field Crops, Oxford and IBH Pub. Co., New Delhi, 2000.
Singh, P., Essentials of Plant Breeding, Kalyani Publishers, New Delhi, 2009.

Paper Code	Course Title	L	T	P	Cr
AGR 312	Principles of Plant Biotechnology	2	0	2	3

UNIT I

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Recombinant DNA Technology; Scope and importance in Crop Improvement. Concepts of Totipotency, Plasticity and Morphogenesis.

UNIT II

In-vitro cultures: Nutritional requirements, Techniques of *in-vitro* cultures, Micro propagation; Somatic embryogenesis and synthetic/artificial seed production technology. Anther/microspore/Pollen culture, Ovule culture, Embryo culture, Endosperm culture, Factors affecting *in-vitro* culture; Applications and Achievements.

UNIT III

Somaclonal variation: Types, Reasons and molecular basis. Protoplast: isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering by Recombinant DNA Technology: Restriction enzymes, Vectors for gene transfer, Gene cloning, Direct and indirect method of gene transfer, Selectable and Scorable markers; GUS, GFP and LacZ *etc.*, Transgenic plants and their applications.

UNIT IV

DNA finger printing: DNA markers; DNA Probes, RFLP, AFLP, RAPD and SSR. Applications and prospects of DNA Markers in crop improvement through QTL mapping and MAS.

Practicals: Requirements for Plant Tissue Culture Laboratory. Media components and preparations. Sterilization techniques and Inoculation of various explants. Callus induction and Plant Regeneration. Anther, Embryo and Endosperm culture. Somatic embryogenesis and synthetic seed production. Isolation of protoplast; Demonstration of Culturing of protoplast. Demonstration of Isolation of DNA. Demonstration of Gene transfer techniques; direct methods, indirect methods; Demonstration of gel-electrophoresis techniques.

Suggested Readings:

Plant Biotechnology by B.D. Singh; Kalyani Publisher
Plant Tissue Culture & Plant Biotechnology by B.D. Singh and J.P. Shrivastva; Kalyani Publisher
Plant Biotechnology: The genetic manipulation of plants by Adrian Slater, Nigel W. Scott and R. Flower; Oxford Publications
DNA Fingerprinting in plants: Principles, methods and Applications by Kurt Weising, Hilde Nybom, Kristen Wolff and Gunter Kahl; CRC Press.

Paper Code	Course Title	L	T	P	Cr
AGR 319	Breeding of Field / Horticultural crops	2	0	2	3

UNIT I

Breeding objectives and important concepts of breeding self-pollinated, cross pollinated and vegetativly propagated crops; Hardy-Weinberg Law; Definition of biometrics, assessment of variability; Genotype x Environment interaction and influence on yield/performance.

UNIT II

Study in respect of origin, distribution of species, wild relatives and forms, Cereals, (rice, wheat, maize, millets, sorghum, bajra,); Pulses (red gram, green gram, black gram, soybean); Oilseeds (Groundnut, sunflower, castor, mustard) and Fibers.

UNIT III

Vegetables (Tomato, Okra, Chilli, cucumbers); Flowers crops (Chrysanthemum, rose & marigold); Fruit crops (Aonla, guava, mango, banana, papaya); Major breeding procedures for development of hybrids / varieties of various crops.

UNIT IV

Plant Genetic Resources their conservation and utilization in crop improvement; Ideotype concept in crop improvement; Breeding for resistance to biotic and abiotic stresses variability in pathogens and pests; Mechanisms of resistance in plant to pathogens and pest; Genetic basis of adaptability to unfavorable environments.

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

Suggested Readings :

Allard, R.W ., Principles of Plant Breeding, John Wiley & Sons, New York, 1999.
Poehlman, J.N. and Borthakur, D.N., Breeding Asian Field Crops, Oxford and IBH Pub. Co.,

New Delhi, 2000.
Singh, B.D., Plant Breeding, Kalyani Publishers. New Delhi, 2009.
Singh, P., Essentials of plant breeding, Kalyani Publishers. New Delhi, 2009.

Paper Code	Course Title	L	T	P	Cr
AGR 416	Seed Production Technology	1	0	4	3

UNIT I

Introduction and importance of seed production, Development, release and notification of varieties; Planting value of seeds; DUS test

UNIT II

Seed multiplication chain; Seed quality-Purity, viability, germination, vigour, etc.; Seed health; Seed dormancy

UNIT III

Hybrid seed production technology (Maize, rice, cotton, tomato, brinjal, etc.); Seed production of cereals, oilseeds, pulses, forage and vegetable crops

UNIT IV

Seed certification; Seed processing and storage; Seed distribution and marketing

Practicals: Planting value of seeds; DUS test; Maintenance of varieties; Nucleus, breeder, foundation and certified seed production of varieties-cereals, oilseeds, pulses, forages and vegetable crops; Parental lines and hybrid seed production technology; Field inspection, weeding, rouging and record maintaining; Seed processing, treatment and storage; Seed lot preparation and seed sampling; Physical purity analysis; Seed germination, viability and moisture content tests; Determination of health status of a seed sample; Breaking of seed dormancy; Determination of genetic purity; Verification of cultivars through biochemical tests; Determination of seed vigour; Blending of seed lots.

Suggested Readings:

Bhale, M.S. and Dhirendra, Khare, Seed Technology, Scientific Publishers, 2014
McDonald, M.B., Seed Sceince and Technology, Scientific Publishers, 2014.
Basavaraju, G.V., Ravishankar, P. and Gowdiperu, Sarika, A Text Book of Seed Science and Technology, Kalyani Publishers, 2014
Subir Sen and Nabinanda Ghosh, Seed Science and Technology, Kalyani Publishers, 2001
Singh, B.D., Plant Breeding, Kalyani Publishers, New Delhi, 2009.
Poehlman, J.N. and Borthakur, D.N, Breeding Asian Field Crops, Oxford and IBH Pub. Co., New Delhi, 2000.
Singh, P., Essentials of plant breeding, Kalyani Publishers, New Delhi, 2009.

DAV UNIVERSITY, JALANDHAR

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

Paper Code	Course Title	L	T	P	Cr
AGR 113	Introduction to Soil Science	2	0	2	3

UNIT I

Introductory knowledge of soil: definition of soil, component of soil Important physical properties of soil: Soil separates/particles, their mechanical analysis and characteristics. Soil texture, soil densities and porosity of soil. Classification of Soil structure, factor effecting soil structure and its importance.

UNIT II

Definition, occurrence and classification of soil forming rocks & minerals. Weathering of rocks and minerals. Factors and processes of soil formation.

UNIT III

Soil Profile, Horizons. Important groups and distribution of soils, soils of India, soils of Punjab (properties and distribution). Classification of soil based on soil taxonomy.

UNIT IV

Formation & problems of Salt effected soils: Different types of Salt effected soils, nature & sources of soluble salt in saline soil, appraisal of saline & sodic soil. Calcareous soil. Reclamations of saline and alkali or sodic soils:

Practicals: Identification of Important rocks and minerals. Examination of soil profile in the field. Soil sampling and use of augers. Determination of water and soil texture. Study of soil color using Munsell soil color charts. Study of soil texture and soil structure of a given sample. Calculations of soil densities and porosity of soil. Calculation of gypsum requirement for given sample. Soil survey of a farm.

Suggested Readings:

Brady, N.C. and Weil, R.R., The nature and Properties of Soil: 13th edn. Pearson education Pte. Ltd. New Delhi, 2002.
Oswal, M.C., Soil Physics, Oxford & IBH publishing Co. Pvt. Ltd. New Delhi, 1994.
Biswas, T.D., and Mukherjee, S.K., Text book of soil science, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1997.

Paper Code	Course Title	L	T	P	Cr
AGR 127	Soil Chemistry, Soil Fertility and Nutrient Management	2	0	2	3

UNIT I

Soil as a source of plant nutrients; Factors affecting nutrient availability to plants; Measures to overcome deficiencies and toxicities; Problem soils – acid, salt affected and calcareous soils, characteristics, nutrient availabilities.

UNIT II

Reclamation – mechanical, chemical and biological methods; Fertilizer and insecticides and their effect on soil water and air; Soil fertility – Different approaches for soil fertility evaluation; Methods, Soil testing – Chemical methods; Critical levels of different nutrients in soil.

UNIT III

Plant analysis – DRIS methods, critical levels in plants; Rapid tissue tests; Indicator plants; Biological method of soil fertility evaluation; Soil test based fertilizer recommendations to crops.

UNIT IV

Factors influencing nutrient use efficiency (NUE) in respect of N, P, K, S, Fe and Zn fertilizers; Source, method and scheduling of nutrients for different soils and crops grown under rainfed and irrigated conditions.

Practicals: Principles of analytical Instruments and their calibration and applications, Colorimetry and flame photometry; Estimation of available N, P, K, S, and Zn in oils, pH, EC, soluble cations and anions in soil water extracts; Lime requirement and gypsum requirement of problem soils; Estimation of N, P and K in plants.

Suggested Readings:

Brady, N.C. and Weil, R.R., The nature and Properties of Soil: 13th edn. Pearson education Pvt. Ltd. New Delhi, 2002.
Oswal, M.C., Soil Physics, Oxford & IBH publishing Co. Pvt. Ltd. New Delhi, 1994.
Biswas, T.D., and Mukherjee, S.K., Text book of Soil Science, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1997.

Paper Code	Course Title	L	T	P	Cr
AGR 229	Manures and Fertilizers	2	0	2	3

UNIT I

Plant nutrition and essential elements in plant nutrition; Factor influencing growth of plant; Classification of plant nutrient; Essential elements in plant nutrition; Different forms of nutrient elements absorbed by plants; General function of plant nutrients (Nitrogen, phosphorus, potassium, calcium, magnesium, Sulphur, iron, manganese, copper, zinc, boron, molybdenum, silicon, sodium).

UNIT II

Mechanism of nutrient uptake; Mechanism of ion translocation in root tissue; Transformation of nitrogen in soil, immobilization; Gain & losses of Nitrogen by soil;
Chelates and plant nutrition Deficiency symptoms of Nitrogen, phosphorus, potassium, Sulphur, Zinc and iron.

UNIT III

Classification of manures; Characteristics of organic manures, FYM, advantage and disadvantages of green manuring, reaction of organic manures in soil; Nitrogenous fertilizers & their classification, chemical reaction of Ammonium sulphate and Urea in soil; Potassic fertilizers and their behavior in soil.

UNIT IV

Phosphate fertilizers and their classification; Chemical reaction of superphosphate in soil; Fertilizers mixture: - advantages, disadvantages, incompatibilities in fertilizers mixture, granulated fertilizers, bio fertilizers; some important Complex fertilizers.

Practicals: Collection of manures and fertilizers Physical characters of manures and fertilizers. Diagnostic technique for soil & crops. Chemical tests for fertilizers of local utilization. Study side or ill effects of fertilizers at village level.

Suggested Readings:

Basak, R.K., Fertilizers, Kalyani Publishers, Ludhiana, 2007.
Brady, N.C. and Weil, R.R., The nature and Properties of Soil: 13th edn, Pearson education Pte. Ltd. New Delhi, 2002.
Russal, E.W., Soil conditions and plant growth, Longman publishers, London, 1961.
Ruth and Turk, J., Fundamentals of soil sciences, J. Wiley & Sons, Inc., London, 1943.

Paper Code	Course Title	L	T	P	Cr
AGR 414	Soil Management (conservation Problematic soil, Soil quality)	1	0	6	4

UNIT I

Soil Health and its indices

UNIT II

Problem soils: acid, saline, saline-alkali, alkali and submerged soils, their properties, extent and distribution,

UNIT III

Management options for each of the problem soils

UNIT IV

Degraded lands- their extent, distribution and management options

Practicals: Collection and processing of soil samples: Chemical analysis in terms of pH, Organic carbon, available N, P, K and S, exchangeable Ca and Mg, micronutrient cations (Fe, Mn, Cu, Zn), physical analysis in terms of textural separates; Water holding capacity, bulk density, infiltration rate; Microbiological parameters in terms of microbial count; Microbial biomass carbon, calculation of lime and gypsum requirement for reclamation of acidic and alkali soils, respectively; On site acquaintance with different types of soil erosion

Suggested Readings:

Rajput, S. G. Concepts of Soil Science, Kalyani Publishers.
Brady, N.C. and Weil, R.R., The nature and Properties of Soil. Pearson education Pte. Ltd. New Delhi,
Indian Society of Soil Science. Fundamentals of Soil Science, ICAR, New Delhi

DAV UNIVERSITY, JALANDHAR

ENTOMOLOGY

Paper Code	Course Title	L	T	P	Cr
AGR 213	Insect Morphology and Systematics	2	0	2	3

UNIT I

History of Entomology in India; Factors for insect abundance; Classification of phylum Arthropoda upto classes; Relationship of class Insecta with other classes of Arthropoda; Morphology: Structure and function of insect cuticle and process of moulting.

UNIT II

Body regions, Structure and Segmentation of Head, Thorax, Abdomen and their appendages Modification of Antennae, Mouth parts, Wings, and Legs; Hypothetical wings venation and wing coupling mechanism.

UNIT III

Study of metamorphosis and diapause in insects; Types of Larvae and Pupae; Structure and functions of digestive system, circulatory system, excretory, respiratory, nervous and reproductive systems in Insects; Types of reproduction in Insects.

UNIT IV

Systematics: Taxonomy: Importance, History and development of binomial nomenclature; Definitions of biotypes, sub species, species, genus, family and order; Classification of insects up to orders.

Practicals: Internal and External Anatomy of Grass hopper; Methods of collection and preservation of insect pests; Types of Antennae, mouth part and legs and types of wings; Types of Larvae and Pupae of insects; Study of digestive system and reproductive system in Insects.

Suggested Readings:

Mani, M.S., General Entomology, Oxford & I.B.H. Pub. New Delhi, 1973.
David, B.V. and Ananthakrishnan, T.N., General and applied Entomology Second Edition, Tata McGraw Hill, New Delhi, 2006.
Nayar, K.K., Ananthakrishanan, T.N., and David, V.B. General and applied entomology, Tata McGraw-Hill, 1976.
Raghumuthy, K.N., Balasubramany, V., Srinivasan, M.R. and Natrajan, N., Insecta- An Introduction, A.E. Publication, Coimbatore, 2006.

Paper Code	Course Title	L	T	P	Cr
AGR 223	Insect Ecology & Integrated pest management including beneficial insects	2	0	2	3

UNIT I

Insect Ecology: Introduction and concept of balance of life in nature, Effect of biotic potential and environmental resistance on insect population; Effect of abiotic and biotic factors on population dynamics of insects; Categories of pests; Pest surveillance and pest forecasting; Causes for outbreak of pests in agro eco systems.

UNIT II

IPM: Introduction, importance, concepts principles and tools of IPM; Practices, scope and limitations of IPM; Traditional methods of pest control: Cultural, Mechanical, Physical,

Legislative, Biological mass multiplication techniques of Beneficial insects (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses. Host plant resistance.

UNIT III

Chemical control – importance, hazards and limitations; Classification of insecticides, toxicity of insecticides and formulations of insecticides; Study of important insecticides; Recent methods of pest control, pheromones, r epellents, antifeedants, hormones, attractants, IGR's, gamma radiation control; Botanical insecticides- neem based products; Insect sterility methods.

UNIT IV

Insecticides Act 1968 – Important provisions; Application techniques of spray fluids; Phytotoxicity of insecticides; Symptoms of poisoning, first aid and antidotes.

Practicals: Studies on behavior of insects and orientation (repellency, stimulation, deterancy); Study of distribution patterns of insects, sampling techniques for the estimation of insect population and damage; Pest surveillance through light traps, pheromone traps and field incidence; Practicable IPM practices, Mechanical and physical methods; Calculation of doses/concentrations of insecticides; Compatibility of pesticides and Phytotoxicity of insecticides; Important species of pollinators, weed killers and scavengers, their importance.

Suggested Readings:

Mani, M.S., General Entomology, Oxford & I.B.H. Pub. New Delhi, 1973.
David, B.V. and Ananthakrishnan, T.N., General and applied Entomology Second Edition, Tata McGraw Hill, New Delhi, 2006.
Nayar, K.K., Ananthakrishanan, T.N., and David, V.B. General and applied entomology, Tata McGraw-Hill, 1976.
Dhaliwal, G.S. and Ramesh Arora, Integrated pest management: concepts and approaches, Kalyani Publishers, Ludhiana, 2003.

Paper Code	Course Title	L	T	P	Cr
AGR 313	Crop Pests and stored grain pests and their management	2	0	2	3

UNIT I

Stored grain pests: Coleopteran and Lepidopteran pests, their biology and damage, preventive and curative methods.

UNIT II

Distribution, biology, Identification features and symptoms of damage, and management strategies of insect pests of important cereals (Rice wheat and maize), pulses (Gram, Green gram and red gram).

UNIT III

Distribution, biology, Identification features and symptoms of damage, and management strategies of insect pests of important oilseeds (Mustard, Sunflower and groundnut), Sugar crops (Sugarcane), fiber crops (Cotton and Sunhemp).

UNIT IV

Distribution, biology, Identification features and symptoms of damage, and management strategies of insect pests of important Horticultural crops (vegetables and fruits).

Practical: Identification of pests, their damage symptoms and management of rice, maize, wheat, sugarcane, cotton, pulses, Solanaceous vegetables, cruciferous and cucurbitaceous

vegetables, mango, citrus and Ber.

Suggested Readings:

Atwal, A.S., and Dhaliwal, G.S Agricultural pest of south Asia and their management, Kalyani Publishers, Ludhiana, 2005.
Dhaliwal G.S. Elements of Agricultural Entomology, Kalyani Publishers, Ludhiana

DAV UNIVERSITY, JALANDHAR

AGRICULTURAL ECONOMICS

Paper Code	Course Title	L	T	P	Cr
AGR 107	Principles of Agricultural Economics	2	0	0	2

UNIT I

Economics: Meaning, Definition, Subject matter, Divisions of Economics, Importance of Economics. Agricultural Economics: Meaning, Definition. Basic Concepts: Goods, Service, Utility, Value, Price, Wealth, Welfare. Wants: Meaning, Characteristics, classifications of Wants. Theory of consumption: Law of Diminishing Marginal utility, Meaning, Definition, Assumption, Limitations, Importance.

UNIT II

Demand: Meaning, Definition, Demand schedule, Demand Curve, Law of Demand, Extension and Contraction Vs Increase and Decrease in Demand. Supply: Meaning, Definition, Supply schedule, Supply curve, Law of Supply, Extension and contraction vs decrease and increase in supply.

UNIT III

Elasticity of Demand: Types of Elasticity of Demand, Degrees of price elasticity of Demand, Methods of Measuring Elasticity, Factors influencing elasticity of Demand, Importance of Elasticity of Demand. Consumer's surplus: Meaning, Definition, Importance. Market structure: definition, classification of market structure. Price determination under perfect competition

UNIT IV

Welfare Economics: Meaning, Pareto's optimality. National Income: Concepts, Measurement. Public Finance: Meaning, Public Resource: Meaning, Services Tax, meaning, classification of Taxes: Cannons of Taxation, Public expenditure: Meaning, Principles. Inflation: Meaning, Definition, Kinds of inflation

Suggested Readings:

Lekhi, R.K. and Singh, J. Agricultural Economics-, Kalyani publishers, Ludhiana, 2007.

Black. J.D., Introduction of Economics for Agriculture, Fromount Pierre National Press, 1955.

Nanavati, M.B. and J. J. Anjaria. The Indian Rural Problem. The Indian Society of Agricultural Economics, Bombay, 1944.

Memoria, C.B. and B.B. Agricultural Problems in India, Kitab Mahal ,Allahabad, 2007.

Paper Code	Course Title	L	T	P	Cr
AEC 211	Agricultural Finance and Co-operation	1	0	2	2

UNIT 1

Agricultural finance: nature and scope. Time value of money, Compounding and Discounting. Agricultural credit: meaning, definition, need, classification. Credit analysis:4R's 5C's and 7 P's of credit,repayment plans. History of financing agriculture in India. Commercial banks, nationalization of commercial banks.

UNIT II

Lead bank scheme, regional rural banks, scale of finance. Higher financing agencies, RBI, NABARD, AFC, Asian Development Bank, World Bank, Insurance and Credit Guarantee Corporation of India. Assessment of crop losses, determination of compensation.

UNIT III

Crop insurance, advantages and limitations in application, estimation of crop yields. Agricultural cooperation: philosophy and principles. History of Indian cooperative Movement, pre-independence and post independence periods, cooperation in different plan periods.

UNIT IV

Cooperative credit structure: PACS, FSCS. Reorganisation of cooperative credit structure in Andhra Pradesh and single window system. Successful cooperative systems in Gujarat, Maharastra, Punjab etc.

Practicals: Time value of money, Compounding and discounting; Tools of financial management, Balance sheet, Income statement and cash flow analysis; Estimations of credit needs and determining unit costs; Preparations and analysis of loan proposals; Types of repayment loans; Study of financial institutions: PACS, DCCB, Apex Banks, RRBs, CBs, NABARD.

Suggested Readings:

Lekhi, R.K. and Singh, J., Agricultural Economics-, Kalyani publishers, Ludhiana, 2007.
Black. J.D., Introduction of Economics for Agriculture, Fromount Pierre National Press, 1955.
Bond H. and Cunnighum, Farm Management, John Wiley and Sons Inc, New York, 1921.
Lekhi, R.K. and Singh, J., Agricultural Economics-, Kalyani publishers, Ludhiana, 2007.

Paper Code	Course Title	L	T	P	Cr
AEC 221	Agricultural marketing, Trade and Prices	1	0	2	2

UNIT I

Agricultural Marketing: Concepts and Definition. Market and Marketing: Meaning, Definitions, Components of a market, Classification. Market structure, Conduct, performance. Marketing structure, Market functionaries or agencies, Producer's surplus: Meaning, Types of producers surplus, marketable surplus. Marketed surplus, importance, Factors affecting Marketable surplus.

UNIT II

Marketing channels: Meaning, Definition, Channels for different products. Market integration, Meaning, Definition, Types of Market Integration. Marketing efficiency: Meaning, Definition, Marketing costs, Margins and price spread, Factors affecting the cost of marketing, Reasons for higher marketing costs of farm commodities, Ways of reducing marketing costs.

UNIT III

Theories of International Trade: Domestic Trade, Free trade, International Trade, GATT, WTO, Implications of AOA. Market access, EXIM-Policy. Cooperative Marketing. State Trading. Ware Housing Corporation; Central and State, Objectives, Functions, Advantages. Food Corporation of India: Objectives and Functions.

UNIT IV

Quality Control, Agricultural Products, AGMARK. Price Characteristics of agricultural product process, Meaning, Need for Agricultural Price Policy. Risk in Marketing: Meaning and importance, Types of Risk in Marketing. Speculations and Hedging, Futures trading, Contract farming.

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

Suggested Readings:

Lekhi, R.K. and Singh, J. Agricultural Economics- Kalyani publishers, Ludhiana, 2007.

Black, J.D. Introduction of Economics for Agriculture, Fromount Pierre National Press, 1955.

Nanavati, M.B. and J. J. Anjaria. The Indian Rural Problem. The Indian Society of Agricultural Economics, Bombay, 1944.

Memoria, C.B. and B.B. Agricultural Problems in India, Kitab Mahal ,Allahabad, 2007.

Paper Code	Course Title	L	T	P	Cr
AGR 321	Production Economics & Farm management	1	0	2	2

UNIT I

Production Economics: Meaning, Definition, Nature and Scope of Agricultural Production Economics. Basic concepts and terms. Concepts of Production. Production function - definition & types - linear, quadratic & Cobb- Douglas functions, Impact of technology. Law of diminishing returns - 3 regions of production.

UNIT II

Laws of returns: Increasing, Constant and decreasing. Factor Product Relationship. Factor - Factor relationship - Principle of substitution - isoquant, isoclines, Expansion path, ridgeline and least cost combination of inputs, Product - Product relationship - types.

UNIT III

Production possibility curve, iso revenue line and optimum combination of outputs. Returns to scale: Meaning, Definition, Importance. Farm Management. Basic concepts in farm management. Production, types of resources, choice indicators, costs, revenue, profit, total, average & marginal concepts.

UNIT IV

Farm planning and Farm budgeting. Linear programming: Assumptions, Advantages and Limitations of Linear programming. Concepts of Risk and uncertainty - types of uncertainty in agriculture - managerial decisions to reduce risks in production process

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

Suggested Readings:

Lekhi, R.K. and Singh, J. Agricultural Economics-, Kalyani publishers, Ludhiana, 2007.

Black. J.D., Introduction of Economics for Agriculture, Fromount Pierre National Press, 1955.

Nanavati, M.B. and J. J. Anjaria. The Indian Rural Problem. The Indian Society of Agricultural Economics, Bombay, 1944.

Memoria, C.B. and B.B. Agricultural Problems in India, Kitab Mahal ,Allahabad, 2007.

Paper Code	Course Title	L	T	P	Cr
AGR 314	Fundamentals of Agri Business Management (Including product development, Appraisal and Monitoring)	1	0	2	2

UNIT I

Agribusiness: Meaning, Definition, Structure of Agribusiness (Input, Farm, Product Sectors). Agribusiness Management, Distinctive features, Importance of Good Management, Definitions of Management. Management Functions, Planning, Meaning, Definition, Types of Plans, characteristics of sound plan, Steps in planning: Organization, Staffing, Directing, Motivation, Ordering, Leading, Supervision, Communication, control.

UNIT II

Agro-based Industries: Importance and Need, Classification of Industries, Types of Agro-based Industries, Institutional arrangement, Procedure to set up agro-based industries, Constraints in establishing agro-based industries. Marketing Management: Meaning, Definitions, Marketing Mix, 4Ps of Marketing. Mix, Market segmentation,

UNIT III

Capital Management. Financial Management of Agribusiness: Importance of Financial Statements, Balance sheet, Profit and Loss Statement, Analysis of Financial statements. Product life cycle. Pricing policy, Meaning, Types of pricing.

UNIT IV

Project, definitions, project cycle, Identification, Formulation, Appraisal, Implementation, Monitoring and evaluation, Appraisal and Evaluation techniques, NPW, BCR, IRR, N/K ratio, sensitivity analysis, characteristics of agricultural projects

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

Suggested Readings:

Lekhi, R.K. and Singh, J. Agricultural Economics- Kalyani publishers, Ludhiana, 2007.

Black, J.D. Introduction of Economics for Agriculture, Fromount Pierre National Press, 1955.

Nanavati, M.B. and J. J. Anjaria. The Indian Rural Problem. The Indian Society of Agricultural Economics, Bombay, 1944.

Memoria, C.B. and B.B. Agricultural Problems in India, Kitab Mahal, Allahabad, 2007.

Paper Code	Course Title	L	T	P	Cr
AEC 413	Natural Resource Economics and Management	1	0	4	3

UNIT I

Natural resource economies – definition, subject matter and scope. Natural resource management. Environmental and Ecological Economics. Natural resource classification and characteristics: Renewable resources, Non- renewable natural resources, Biotic resources, Abiotic resources. Natural resources: Water resource, Forest resources. Deforestation. Resources characteristics**.**

UNIT II

Resource depletion, Causes of resource depletion. Potential Resources, Actual resources. Management of renewable and non-renewable resources. Economic Approaches to Resource Management. Major issues in use of natural resources – productivity, equity &sustainability.

UNIT III

Consumption — population, technology, resources. List of environmental issues. Equity and issues in equity of natural resources. Intra-generational equity. Equity issues, key parameters and indicators. Discount rate. Discrete cash flows. Continuous cash flows. Opportunity cost.

UNIT IV

Market efficiency, externalities and types. Market efficiency levels. Market failure. Market power, Monopoly, Monopsony, Oligopoly, and Oligopsony. Public goods. Property right as right of control. Externalities. Externalities types. Policies for Externalities. Travel Cost Model. Random Utility Models. Hedonic Pricing Methods. Common methods for estimating prices for publicly provided natural resources.

Practical: Temporal and spatial elements in natural resources. Natural resources accounting. Utility functions. Social welfare functions. Estimation of economic losses of environmental degradation. Environmental costs of technological development. Environmental legislation. Benefit-cost analysis. Break even analysis, Different concepts of costs. Project evaluation techniques.

Suggested Readings:

1. Randall Alan (1987), Resource Economics: An Economic Analysis Approach to Natural Resource & Environmental Policy, John Wiley, New York.

2. Kerr, John M., et al. (1997). Natural Resource Economics: Theory and Applications in India, Oxford & U3H, New Delhi.

3. Tisdell C. (1993), Environmental Economics: Policies for Environmental Management & Sustainable Development, Edward Elgar Pub. Ltd., USA.

4. Pearce David, Edward Barber & Anil Markandya, Sustainable Development: Economics & Environmental in the Third World, Eastern Publications Ltd., London.

5. Singh, Mohan M. (1993). Environmental Economics & Natural Resource Management in Developing countries. World Bank.

DAV UNIVERSITY, JALANDHAR

AGRICULTURAL ENGINEERING

Paper Code	Course Title	L	T	P	Cr
AGR 114	Fundamentals of soil water conservation and engineering	2	0	2	3

UNIT I

Surveying: survey equipment, chain survey, cross staff survey, plotting procedure, calculations of area of regular and irregular fields.

UNIT II

Levelling – levelling equipment, terminology, methods of calculation of reduced levels, types of levelling, contouring. Irrigation, classification of projects, flow irrigation and lift irrigation. Water source, Water lifting devices – pumps (shallow and deep well), capacity, power calculations. Irrigation water measurement – weirs, flumes and orifices and methods of water measurement and instruments.

UNIT III

Water conveyance systems, open channel and underground pipeline. Irrigation methods – drip and sprinkle irrigation systems.

UNIT IV

Soil and water conservation – soil erosion, types and engineering control measures.

Practicals: Acquaintance with chain survey equipment; Ranging and measurement of offsets; Chain triangulation; Cross staff survey; Plotting of chain triangulation; Plotting of cross staff survey; Levelling equipment – dumpy level, levelling staff, temporary adjustments and staff reading; Differential leveling; Profile leveling; Contour survey – grid method; Plotting of contours; Study of centrifugal pumping system and irrigation water measuring devices; Study of soil and water conservation measures.

Suggested Readings:

Nakra, C.P. Farm machines and equipment, Dhanpat Rai Publishing Company, New Delhi, 2009.

Srivastava, A.C. and Primlari, R. Elements of Farm Machinery, Oxford & IBH Publishing Company, New Delhi, 2008.

Jain, S.C. and Rai, C.R. Farm Tractor-maintenance and repair, Standard Publishing Distributers, New Delhi, 2008.

Paper Code	Course Title	L	T	P	Cr
AGR 214	Farm power and machinery	1	0	2	2

UNIT I

Farm power in India: sources, I.C engines, working principles, two stroke and four stroke engines, I.C. engine terminology, different systems of I.C. engine.

UNIT II

Tractors, Types, Selection of tractor and cost of tractor power; Tillage implements: Primary and Secondary tillage implements,

UNIT III

Implements for intercultural operations, seed drills, paddy transplanters, plant protection equipment and harvesting equipment;

UNIT IV

Equipment for land development and soil conservation.

Practicals: Study of different components of I.C. Engine; Study of working of four stroke engine; Study of working of two stroke engine; Study of M.B. plough, measurement of plough size, different parts, horizontal and vertical suction, determination of line of pull etc.; Study of disc plough; Study of seed–cum-fertilizer drills-furrow opener, metering mechanism, and calibration; Study, maintenance and operation of tractor; Learning of tractor driving; Study, maintenance and operation of power tiller; Study of different parts, registration, alignment and operation of mower. Study of different inter cultivation equipment in terms of efficiency, field capacity; Repairs and adjustments and operation of sprayers; Repairs and adjustments and operation of dusters; Study of paddy transplanters.

Suggested Readings:

Nakra, C.P., Farm machines and equipment, Dhanpat Rai Publishing Company, New Delhi, 2009.

Srivastava, A.C. and Primlari, R., Elements of Farm Machinery, Oxford & IBH Publishing Company, New Delhi, 2008.

Jain, S.C. and Rai, C.R., Farm Tractor-maintenance and repair, Standard Publishing Distributers, New Delhi, 2008.

Paper Code	Course Title	L	T	P	Cr
AGR 224	Protected cultivation and Post-harvest Technology	1	0	2	2

UNIT I

Green house technology, Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of greenhouse for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses.

UNIT II

Irrigation systems used in greenhouses, Typical applications, passive solar green house, hot air greenhouse heating systems, green house drying. Cost estimation and economic analysis. Choice of crops for cultivation under greenhouses, problems / constraints of greenhouse cultivation and future strategies. Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics.

UNIT III

Threshing, threshers for different crops, parts, terminology, care and maintenance. Winnowing, manual and power operated winnowers, care and maintenance. Groundnut decorticators, hand operated and power operated decorticators, principles of working, care and maintenance. Maize shellers & castor shellers.

UNIT IV

Drying, grain drying, types of drying, types of dryers. Storage, grain storage, types of storage structures. Fruits and vegetables cleaning, machinery for cleaning of fruits and vegetables, care and maintenance. Grading, methods of grading, equipment for grading of fruits and vegetables, care and maintenance. Size reduction. Equipment for size reduction care and maintenance. Evaporation, Principle, types of evaporators, quality standards – FAQ, ASTA, FPO, and FDA.

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

Suggested Readings:

Panday P.H. Principles and Practices of Post-Harvest Technology
Verma L.R. and Joshi V.K. Post-Harvest Technology of Fruits and Vegetables
Girdharilal G.S. Sidhappa and Tondan G.L. Fruits and Vegetable preservation.
Prasad S. and Kumar U. Green house management for Horticultural Crops, Agrobio (India)
Chakraverty A. Post-Harvest Technology of Cereals, Pulses and Oilseeds, Oxford & IBH Publishing Co. Pvt. Ltd.

Paper Code	Course Title	L	T	P	Cr
AGR 326	Renewable Energy	1	0	2	2

UNIT I

Energy sources, Introduction, Classification, Energy from Biomass, Types of biogas plants, constructional details, Biogas production and its utilization, Agricultural wastes, Principles of combustion, pyrolysis and gasification, Types of gasifiers, Producer gas and its utilization.

UNIT II

Briquettes, Types of Briquetting machines, uses of Briquettes, Shredders. Solar energy, Solar flat plate and focusing plate collectors, Solar air heaters, Solar space heating and cooling, Solar energy applications / Solar energy gadgets, Solar cookers, Solar water heating systems, solar grain dryers, Solar Refrigeration system, Solar ponds, Solar photo voltaic systems, solar lantern, Solar street lights, solar fencing, Solar pumping systems.

UNIT III

Wind energy, Types of wind mills, Constructional details & application of wind mills.

UNIT IV

Liquid Bio fuels, Bio diesel and Ethanol from agricultural produce, its production & uses.

Practicals: Constructional details of KVIC & Janatha type biogas plants; Constructional details of Deen Bandhu type biogas plants; Field visit to biogas plants; Briquette preparation from biomass; To study and find the efficiency of solar cooker; To study and find the performance of a solar still; To study and find the performance of a solar dryers; Study and working of solar photovoltaic pumping system; Study and performance evaluation of domestic solar water heater; Study and performance evaluation of solar lantern; Study and performance evaluation of solar street light; To study the processing of Bio-diesel production from Jatropha.

Suggested Readings:

Mahur A.N. and Rathore N.S. New and Renewable Energy Sources
Khandelwal K.C. and Mandi S.S.. Bio-gas Technology
Twivell J.N. and Weir A. Renewable Energy Sources

DAV UNIVERSITY, JALANDHAR

PLANT PATHOLOGY

Paper Code	Course Title	L	T	P	Cr
AGR 115	Plant Pathogens and Principles of Plant Pathology	3	0	2	4

UNIT I

Introduction to plant pathology- plant diseases, their importance and related terminology. History of plant pathology and causes of plant diseases- inanimate, viral and animate causes, classifications of plant diseases.

UNIT II

Diseases caused by Fungi, Bacteria, virus and viroids, mycoplasmas, nematodes and phanerogamic parasites. Symptoms of plant diseases caused by various pathogens.

UNIT III

Pathogenicity and Koch's postulates. Nutrition of plant pathogens – culture media, classification of media and pure culture. Role of toxins, PGRs and Enzymes in plant diseases.

UNIT IV

Defence mechanism of plants- structural and biochemical defence. Control of plant diseases- exclusion and eradication, biological methods and chemical methods. Epidemiology and forecasting of plant diseases.

Practicals: Working of a compound microscope, study of symptoms of major plant diseases, familiarization with instruments and glassware used in plant pathology laboratory, sterilization techniques, and preparation of culture media and isolation of fungal/bacterial plant pathogens. Preparation of Boudreaux and burgundy mixture/paste. Study of disease symptoms/collection of various diseased samples.

Suggested Readings:

Agrios, G.N.1998, Plant Pathology, 3rd Edition Academic Press, New York.
Alexopolus, C.J. and Mims, 1989, Introductory Mycology, Willey Eastern Ltd., New Delhi.
Alice, D., C. Jayalakshmi and K. Sethuraman 2007. Hand Book on Introductory Plant Pathology, A.E. Publication, Coimbatore.
Dasgupta, M.K.1988. Principles of Plant Pathology, Allied Publishers Pvt. Ltd. Bangalore
Maramorach, K. 1998. Plant Diseases of Viral, Viroid, Mycoplasma and uncertain Etiology, Oxford and IBM publications, New Delhi.
Mehrotra, R.S. 1990. An Introductions to Mycology, Willey Eastern Ltd., New Delhi.
Narayanasamy, P.1997. Plant Pathogens and Detections and Diseases Control Oxford and IBH Publishing Co. Ltd, New Delhi.

Paper Code	Course Title	L	T	P	Cr
AGR 118	Introductory Nematology	1	0	2	2

UNIT I

Introduction: History of phytonematology. Economic importance. General characteristics of plant pathogenic nematodes.

UNIT II

Nematode general morphology and biology. General Classification of nematodes Classification of nematodes by habitat.

UNIT III

Symptoms caused by nematodes with examples. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses.

UNIT IV

Different methods of nematode management. Cultural methods, physical methods (Biological methods, Chemical methods, resistant varieties.

Practicals: Working and parts of a compound microscope, methods for nematode sampling, isolation of nematodes from soil (Baermann's funnel method) and plant materials. Fixation and staining of nematodes, gross morphology of nematodes, measurement of nematodes and demonstration of soil solarisation for nematode control.

Suggested Readings:

Walia R.K. and Bajaj H.K. Introductory Nematology
Pathak and B.S. Yadav. Plant Nematology
Dasgupta D.R., Swaroop Gopal and Koshi P.K. Plant Diseases
Ravichandra N.J. Methods and techniques in plant nematology, PHI Learning Pvt. Ltd.
Jonathan E.I. Nematology- Fundamentals and applications, New India Publishing Agency.

Paper Code	Course Title	L	T	P	Cr
AGR 225	Diseases of Field Crops and their management	2	0	2	3

UNIT I

Economic importance, symptoms, cause, epidemiology and disease cycle and management of diseases of rice, sorghum, bajra, maize and wheat.

UNIT II

Economic importance, symptoms, cause, epidemiology and disease cycle and management of diseases of redgram, bengalgram, greengram and pea.

UNIT III

Economic importance, symptoms, cause, epidemiology and disease cycle and management of diseases of sugarcane, turmeric, tobacco and cotton.

UNIT IV

Economic importance, symptoms, cause, epidemiology and disease cycle and management of diseases of groundnut, tea and coffee.

Practicals: Collection and the study of symptoms of the diseased samples of field crops. Frequent visits to the University field/surrounding fields at appropriate times during the semester to study the symptoms, etiology, severity, host-parasite relationship and specific control measures of various diseases.

Suggested Readings:

Diseases of crop plants in India - G. Rangaswami and Madhwan, A, PHI Learning Pvt. Ltd.
Thind, T.S., 2005. Diseases of field crops and their management. Daya Books.

Paper Code	Course Title	L	T	P	Cr
AGR 328	Diseases of Horticultural Crops and their management	2	0	2	3

UNIT I

Economic importance, symptoms, cause, epidemiology and disease cycle and management of diseases of potato, tomato, brinjal and chilli

UNIT II

Economic importance, symptoms, cause, epidemiology and disease cycle and management of diseases of okra, cucurbits, crucifers and beans

UNIT III

Economic importance, symptoms, cause, epidemiology and disease cycle and management of diseases of Citrus, mango, banana, grapevine, papaya, apple, peach and guava

UNIT IV

Economic importance, symptoms, cause, epidemiology and disease cycle and management of diseases of rose and chrysanthemum

Practicals: Study/collection of the symptoms of the diseases of horticulture crops in University/surrounding fields or by preserved specimens.

Suggested Readings:

Gupta VK &.Sharma SK. 2000. Diseases of Fruit Crops. Kalyani Publ., New Delhi.
Verma, L.R. and Sharma, R.C., 1999. Diseases of horticultural crops: vegetables, ornamentals, and mushrooms. Indus Publishing.
Singh RS. 2000. Diseases of Fruit Crops. Oxford & IBH, New Delhi.
Walker JC. 2004. Diseases of Vegetable Crops. TTPP, India.
Gupta, S.K and Thind, T.S. Disease problems in vegetable production, Scientific Publishers India

Paper Code	Course Title	L	T	P	Cr
AGR 412	IPM and IDM	2	0	4	4

UNIT I

Introduction to Integrated pest and disease management, its history, importance and principles. General concepts and terms related to plant pest/disease management and its relation to yield economics and environmental sustainability.

UNIT II

Pest monitoring and surveillance; different tools of IPM including physical, mechanical, cultural, biological, hostplant resistance, botanical, chemical, biorationals and biotechnological approaches; integration of different IPM tactics; decision making systems; potential of IPM, its implementation and constraints; successful examples in IPM

UNIT III

Avoidance and exclusion of the pathogen, regulatory methods to control plant diseases, Reduction of pathogen inoculum by cultural, physical, Chemical and biological methods. Host resistance and resistant variety deployment. Integrated approach for plant disease management.

UNIT IV

Equipment used for application of plant protectant chemicals, properties of ideal plant protection chemical (fungicides/antibiotic, insecticide etc.) and associated precautions. Case study of various IPM/IDM packages. Concept of priority, various stages of IPM/IDM.

Practicals: Raising of a field/vegetable crop employing complete IPM/IDM package, assessment of losses due to pests/pathogens and symptomatology. Preparations of some pesticide/fungicide formulation, description of various equipment used for the application of various plant protection chemicals.

Suggested readings:

Ciancio, A. and Mukerji, K.G. eds., 2007. General concepts in integrated pest and disease management. Springer.

Abrol, D.P. and Shankar, U. eds., 2012. Integrated pest management: principles and practice. CABI

Nene, Y.L. and Thapliyal, P.N., 1993. Fungicides in plant disease control. International Science Publisher.

Chattopadhyay, S.B., 1980. Principles and procedures of plant protection. Oxford & IBH Publishing Company.

DAV UNIVERSITY, JALANDHAR

HORTICULTURE

Paper Code	Course Title	L	T	P	Cr
AGR 226	Production technology of spices, Aromatics Medicinal and Plantation crops	2	0	2	3

UNIT I

Production technology of Spices: Ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek

UNIT II

Production technology of Plantation crops: coconut, arecanut, cashew, cocoa, coffee

UNIT III

Production technology of Aromatic crops: lemongrass, citronella, palmarose, geranium

UNIT IV

Production technology of Medicinal plants: Diascoria, rauvolfia, opium, ocimum, aloe, guggul, *Solanum khasiamum*, aonla, plantago, stevia

Practical: Botanical description and identification of aromatic plants; Identification of varieties in spices and plantation crops; Identification of medicinal plants ; Identification of aromatic plants; Distillation procedures for aromatic crops; Propagation methods in plantation crops; Propagation and planting methods in turmeric; Propagation and planting techniques in ginger; Harvesting procedures in aromatic plants; Processing and curing of spices (ginger ,turmeric). Products–by products of spices and plantation crops; Visit to aromatic &medicinal plant nurseries and seed spices field.

Suggested Readings:

Adams, C.R. and M. P. Early. 2004. Principles of horticulture. Butterworth – Heinemam, Oxford University Press.

Chadha, K.L. 2001, Handbook of Horticulture, ICAR, New Delhi.

Chattopadhyaya, P.K.2001. A text book on Pomology (Fundamentals of fruit growing) Kalyani Publication, New Delhi.

Christopher, E.P. 2001. Introductory Horticulture, Biotech Books, New Delhi.

Edmond, J.B. T.L. Senn, F.S. Andrews and P.G.Halfacre, 1975. Fundamentals of Horticulture, Tata McGraw Hill Publishing Co. New Delhi.

Jitendra Singh. 2006. Basic Horticulture. Kalyani Publishers, New Delhi.

Rajan, S. and B.L. Markose. 2007. Propagation of horticultural crops. New India Publishing, New Delhi.

Singh, N.P. 2005. Basic concepts of fruit science. International Book Distributing Co., Lucknow.

Surendra Prasad and U. Kumar. 1999. Principles of horticulture, Agro-botanica, Bikaner,India.

Paper Code	Course Title	L	T	P	Cr
AGR 215	Production Technology of Vegetables and Flowers	2	0	2	3

UNIT I

Importance of Olericulture, vegetable gardens, vegetable classification. Origin, area, production, varieties, package of practices for fruit vegetables–, tomato, brinjal, chillies, and okra

Cucurbitaceous vegetables: cucumber, ridge gourd, bottle gourd, bitter gourd and melons,

UNIT II

Cole crops: cabbage, cauliflower and knol-khol.
Bulb crops: Onion and garlic
Beans and pea,
Tuber crops: potato
Root crops: carrot, radish

UNIT III

Leafy vegetables: amaranthus, palak
Perennial vegetables: drumstick, and curryleaf.
Importance of ornamental gardens, Planning of ornamental gardens

UNIT IV

Types and styles of ornamental gardens. Use of trees, shrubs, climbers, palms, house plants and seasonal flowers in the gardens. Package of practices for rose, chrysanthemum, ,marigold and tuberose.

Practical: Planning and layout of kitchen garden; Identification of important vegetable seeds and plants; Raising of vegetable nurseries; Identification of ornamental plants (trees , shrubs, climbers, houseplants, palms etc.,) and development of garden features; Transplanting of vegetable seedlings in main field; Layout of lawns and maintenance; Seed extraction in tomato and brinjal; Depotting, repotting and maintenance of house plants; Visit to commercial vegetable farms; Training and pruning of rose and chrysanthemum (pinching and disbudding); Planning and layout of gardens and garden designs for public and private areas; Intercultural operations in vegetable plots; Seed production in vegetable crops ;Harvesting indices of different vegetable crops; Prolonging the shelf life of cut flowers.

Suggested Readings:

Dhaliwal M.S., Handbook of vegetable crops, Kalyani Publishers, Ludhiana, 2008.
Das , P.C., Vegetable crops of India, Kalyani Publishers, Ludhiana, 1993.
Chauhan, D.V., Vegetable production in India, S. Ram Prasad and Sons, Agra, 1993
Package of Practices for Vegetable crops, P.A.U. Publications Ludhiana, Corresponding year.

Paper Code	Course Title	L	T	P	Cr
AGR 310	Production technology of fruit crops	2	0	2	3

UNIT I

Definition and importance of horticulture. Divisions of horticulture. Climatic zones of horticulture crops. Area and production of different fruit crops. Selection of site, fencing, and wind break, planting systems

UNIT II

High density planting, planning and establishment. Propagation methods and use of rootstocks Methods of training and pruning. Use of growth regulators in fruit production.

UNIT III

Package of practices for the cultivation of major fruits – mango, banana, citrus, grape, guava, sapota, apple, litchi and papaya

UNIT IV

Minor fruits – pineapple, annonaceous fruits, pomegranate, ber, fig, phalsa, jack, pear, plum, peaches and cherry.

Practical: Study of horticultural tools and implements and their uses; Containers, potting mixture, potting, depotting and repotting; Plant propagation, by seed ,cutting, layering; Layout and planting systems; Methods of pruning and training, Description and identification of

varieties of major subtropical tropical and temperate fruits. Irrigation and fertilizer application methods in fruit crops including drip – Micro irrigation. Preparation and application of growth regulators, powder, solution and lanolin paste for propagation.

Suggested Readings

Singh Jitendra. Basic Horticulture Kalyani Publishers
Bal J.S. Fruit growing Kalyani Publishers
Handbook of Horticulture by ICAR

Paper Code	Course Title	L	T	P	Cr
AGR 317	Post-harvest management and value addition of fruits and vegetables	1	0	2	3

UNIT I

Importance of post-harvest technology in horticultural crops. Maturity indices, harvesting and post-harvest handling of fruits and vegetables. Maturity and ripening process. Factors affecting ripening of fruits, and vegetables. Pre harvest factors affecting quality on post-harvest shelf life of fruits and vegetables. Factors responsible for deterioration of harvested fruits and vegetables.

UNIT II

Chemicals used for hastening and delaying ripening of fruits and vegetables. Methods of storage – precooling, prestorage treatments, low temperature storage, controlled atmospheric storage, hypobaric storage, irradiation and low cost storage structures.

UNIT III

Various methods of packing, packaging materials and transport. Packing technology for export. Fabrication of types of containers, cushioning material, vacuum packing, poly shrink packing, specific packing for export of mango, banana, grapes kinnow, sweet orange, and mandarin etc. Importance and scope of fruit and vegetable preservation in India.

UNIT IV

Principles of preservation by heat, low temperature, chemicals and fermentation. Unit layout – selection of site and precautions for hygienic conditions of the unit. Preservation through canning, bottling, freezing, dehydration, drying, ultraviolet and ionizing radiations. Preparation of jams, jellies, marmalades, candies, crystallized and glazed fruits, preserves, chutneys, pickles, ketchup, sauce, puree, syrups, juices, squashes and cordials Spoilage of canned products, biochemical, enzymatic and microbial spoilage. Preservatives, Colours permitted and prohibited in India.

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

Suggested Readings:

Panday P.H. Principles and Practices of Post-Harvest Technology

Verma L.R. and Joshi V.K. Post-Harvest Technology of Fruits and Vegetables
Sudheer K.P. Post-Harvest Technology of Horticultural Crops
Mir M.A. Post-Harvest Management of Horticultural Crops
Girdharilal, Sidhappa G.S. and Tondan, G.L. Fruits and Vegetable preservation

Paper Code	Course Title	L	T	P	Cr
AGR 415	Commercial Vegetable Production	1	0	4	3

UNIT I

Importance of vegetables in human diet, Commercial vegetables of different agro-climatic zones, Improved varieties/hybrids, sowing/planting times and methods, seed rate, spacing, nutrients and irrigation requirements, intercultural operations, harvesting, and plant protection for raising commercial crops like tomato, brinjal and hot/bell pepper.

UNIT II

Improved varieties/hybrids, sowing/planting times and methods, seed rate, spacing, nutrients and irrigation requirements, intercultural operations, harvesting, and plant protection for raising commercial crops like Garden pea, Cucumber, bottle gourd and bitter gourd.

UNIT III

Improved varieties/hybrids, sowing/planting times and methods, seed rate, spacing, nutrients and irrigation requirements, intercultural operations, harvesting, and plant protection for raising commercial crops like Okra, Cabbage and cauliflower.

UNIT IV

Improved varieties/hybrids, sowing/planting times and methods, seed rate, spacing, nutrients and irrigation requirements, intercultural operations, harvesting, and plant protection for raising commercial crops like radish, carrot and onion.

Practical

Identification of vegetable seeds, crops and important varieties , Nursery raising practices, Cultural operations namely, sowing/transplanting, fertilizer application, intercultural operations, weed control, mulching, irrigation, pest management, harvesting and post harvest handling of commercial vegetable crops, Identification of important physiological disorders and their management, Exposure visit to the commercial vegetable pockets.

Suggested Readings:

Dhaliwal M.S., Handbook of vegetable crops, Kalyani Publishers, Ludhiana, 2008.
Das, P.C., Vegetable crops of India, Kalyani Publishers, Ludhiana, 1993.
Chauhan, D.V., Vegetable production in India, S. Ram Prasad and Sons, Agra, 1993. Package of Practices for Vegetable crops, P.A.U. Publications Ludhiana, Corresponding year.

DAV UNIVERSITY, JALANDHAR

AGRICULTURAL EXTENSION

Paper Code	Course Title	L	T	P	Cr
AGR 125	Dimensions of Agril. Extension	1	0	2	2

UNIT I

Education – Meaning, Definition, Types – Formal, Informal and Non-formal education and their Characteristics. Extension Education and Agricultural Extension – Meaning, Definition, Concepts. Objectives and Principles. Rural development – Meaning, Definition, Concepts, Objectives, Importance and Problems in rural development. Developmental programmes of pre-independence era – Sriniketan, Marthandam, Gurgaon experiment and Gandhian constructive proprogramme.

UNIT II

Development programmes of Post-independence era, Firka Development, Etawah – Pilot project and Nilokheri Experiment. Community Development Programme – Meaning, Definition, Concepts. Panchayat Raj system – Meaning of Democratic – Decentralization and Panchayat Raj, Three tiers of Panchayat Raj system, Powers, Functions and Organizational setup. Agricultural Development.

UNIT III

Programmes with reference to year of start, objectives & salient features – Intensive Agricultural District Programme (IADP), High Yielding Varieties Programme (HYVP), Institution Village Linkage Programme (IVLP), Watershed Development Programme (WDP), National Agricultural Technology Project (NATP), ATMA, ATIC. Social Justice and Poverty alleviation programmes – Integrated Tribal Development Agency (ITDA), Integrated Rural Development Programme (IRDP), Swarna Jayanti Gram Swarojgar Yojana (SGSY), and Prime Minister Employment Yojana (CMEY).

UNIT IV

New trends in extension, privatization. Women Development programmes – Development of Women and Children in Rural Areas (DWCRA), Rashtriya Mahila Kosh (RMK), Integrated Child Development Scheme (ICDS) and Mahila Samriddi Yojana (MSY). Reorganized extension system (T&V System) – Salient features, Fort night Meetings, Monthly workshops, Linkages, Merits and Demerits, Emergence of Broad Based Extension (BBE).

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

Suggested Readings:

Mondal, S. and Ray G.L., A Text book of Rural Development. Kalyani Publishers, Chennai, 2007.

Dharma, O.P. and Bhatnagar, O.P., Education and Commnication for Development. Oxford, IBH, New Delhi, 2003.

Desai, A.R., Rural Sociology in India. Popular Prakashan, Bombay, 2003.

Samanta, R.B., Agricultural Extension in Changing World perspective. UDH Publishing, New Delhi, 1991.

Ray G.L., Extension Communication and Management, Kalyani Publishers, Chennai, 2007.

DAV UNIVERSITY, JALANDHAR

Paper Code	Course Title	L	T	P	Cr
AGR 316	Fundamentals of Rural Sociology and Educational Psychology	2	0	0	2

UNIT I

Extension Education and Agricultural Extension – Meaning, Definition, Scope and Importance. Sociology and Rural Sociology, Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and Interrelationship between Rural Sociology & Agricultural Extension. Indian Rural Society, Important characteristics, Differences and Relationship between Rural and Urban societies. Social Groups – Meaning, Definition, Classification, Factors considered in formation and organization of groups, Motivation in group formation and Role of Social groups in Agricultural Extension.

UNIT II

Social Stratification Meaning, Definition, Functions, Basis for stratification, Forms of Social stratification, Characteristics and Differences between Class & Caste System. Cultural concepts –Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions – Meaning, Definitionand 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.

UNIT III

Social Organizations – Meaning, Definition, Types of organizations and Role of Social organizations in Agricultural Extension. Social Control – Meaning, Definition, Need of social control and Means of Social control. Social change – Meaning, Definition, Nature of Social change, Dimensions of social change and factors of social change. Leadership – Meaning, Definition, Classification, Roles of a leader, Different methods of Selection of Professional and Lay leaders. Training of Leaders – Meaning, Definition, Methods of training, Advantages and Limitations in use of local leaders in Agricultural Extension.

UNIT IV

Psychology and Educational Psychology – Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension Intelligence – Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension. Personality – Meaning, Definition, Types, Factors influencing the Personality and Role of personality in Agricultural Extension. Teaching – Learning process –Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics. Principles of learning and their implication for teaching

Suggested Readings:

Chitambar, J.B. Introductory Rural Sociology, Wiley Eastern Private Limited, New Delhi
Dahama O.P. and Bhatnagar, O.P. Education and communication for development, Oxford and IBH Publishing Co. New Delhi
Desai, A.R. Rural Sociology in India, Popular Prakashan, Bombay
Jitendra Mohan. Educational Psychology, Wiley Eastern Limited, New Delhi
Rai, B.C. Educational Psychology, Prakashan Kendra, Lucknow

Paper Code	Course Title	L	T	P	Cr
AGR 322	Extension Methodologies for Transfer of Agricultural Technology	1	0	2	2

UNIT I

Communication – Meaning, Definition, Models, Elements and their Characteristics, Types

and Barriers in communication. Extension teaching methods Meaning, Definition, Functions and Classification.

UNIT II

Individual contact methods – Farm and Home visit, Result Demonstration, Field trials – Meaning, Objectives, Steps, Merits and Demerits. Group contact methods – Group discussion, Method demonstration, Field Trips – Meaning, Objectives, Steps, Merits and Demerits. Small group discussion techniques – Lecture, Symposium, Panel, Debate, Forum, Buzz group, Workshop, Brain Storming, Seminar and Conference.

UNIT III

Mass contact Methods – Campaign, Exhibition, Kisan Mela, Radio & Television, Meaning, Importance, Steps, Merits & Demerits. Factors influencing in selection of Extension Teaching Methods and Combination (Media Mix) of teaching methods. Innovative Information sources – Internet, Cyber Cafes, Video and Tele conferences, Kisan call centers, Consultancy clinics.

UNIT IV

Diffusion and Adoption of Innovations – Meaning, Definition, Models of adoption Process, Innovation – Decision Process – Elements, Adopter categories and their characteristics, Factors influencing adoption process. Capacity building of Extension Personnel and Farmers – Meaning, Definition, Types of training, Training to farmers, farm women and Rural youth – FTC and KVK.

Practical: Simulated exercises on communication. Identifying the Problems, Fixing the Priorities and selecting a most important problem for preparation of a project. Developing a project based on identified problems in a selected village. Organization of Group discussion and Method demonstration. Visit to KVK / FTC. Planning and Preparation of Agricultural Information materials – Leaflet, Folder, Pamphlet, News Stories, Success Stories.

Suggested Readings:

Dahama O.P. and Bhatnagar, O.P. Education and communication for development, Oxford and IBH Publishing Co. New Delhi

Ray G.L. Extension Communication and Management

Sandhu A.S. A Text Book of Agricultural Communication

Rogers E.M. Diffusion of Innovation

Paper Code	Course Title	L	T	P	Cr
AGR 327	Entrepreneurship Development	1	0	2	2

UNIT I

Concept of entrepreneur, entrepreneurship, functions o entrepreneur. Entrepreneurial characteristics, Distinction between an entrepreneur and a manager, Agri-entrepreneurship-concept, need and scope. Assessing overall business environment in Indian economy, globalization, implications of social, political and economic systems on entrepreneurship.

UNIT II

Entrepreneurship development programmes (EDPs) - objectives, phases, problems of EDPs, Criteria for assessment or evaluation of EDPs. Generation, incubation and commercialization of business ideas. Role of entrepreneurship in economic development, Motivation and entrepreneurship development, Managing an enterprise.

UNIT III

Importance of planning, budgeting, monitoring, evaluation and follow up in running an enterprise. Researching / managing competition- ways to define possible competitors, competitive information, SWOT analysis-concept, meaning and advantages. Venture capital-concept, aims, features, financing steps sources, criteria to provide venture capital finance,

Export & Import policies relevant to agriculture sector. Forms of business-contract farming, joint venture and public private partnership

UNIT IV

Social responsibility and business ethics. Government schemes and incentives for promotion of entrepreneurship and government policy on small and medium enterprises. Supply chain management- meaning, advantages, stages, process, drivers and scope of agri-supply chain management, Women entrepreneurship-concept, problems and development of women entrepreneurs

Practical: Development of project proposals - idea generation.Development of project proposals - SWOT analysis. Development of project proposals - formulation of project plan. SWOT analysis of selected enterprise. Field visit to successful enterprise - study of characteristics of successful entrepreneurs - case study.

Suggested Readings:

Anil Kumar, S., Poornima, S.C., Mini, K., Abraham and Jayashree, K. 2003. Entrepreneurship Development, New Age International Publishers, New Delhi.

Mary Coulter. 2008. Entrepreneurship in Action. Prentice Hall of India Pvt. Ltd., New Delhi.

Mohanty, S.K. 2009. Fundamentals of Entrepreneurship. Prentice Hall of India Pvt. Ltd., New Delhi.

DAV UNIVERSITY, JALANDHAR

BIOCHEMISTRY/PHYSIOLOGY/ MICROBIOLOGY/ ENVIRONMENTAL SCIENCES

Paper Code	Course Title	L	T	P	Cr
AGR 323	Biochemistry	2	0	2	3

UNIT I

Biochemistry: Introduction and importance. Plant cell and Cell wall. Bio-molecules; Structure, properties & applications. Amino acids, peptides, proteins and their quality.

UNIT II

Enzymes: Enzyme kinetics, Factors affecting the activity, classification, immobilization and other industrial applications. Lipids, Carbohydrates, Nucleotides and Nucleic acids.

UNIT III

Metabolism:Basic concepts, Glycolysis, Citric acid Cycle, Pentose phosphate pathway, oxidative phosphorylation, Fatty acid oxidation.

UNIT IV

Biosynthesis: Carbohydrates, Lipids, Proteins and Nucleic acids. Metabolic regulation. Secondary metabolites and their applications.

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

Suggested Readings:

Nelson, D.L. and Cox, M.M., Principles of biochemistry, Macmillan Publishers.
Goodwin, T.W., and Mercer, E.I., Introduction to plant biochemistry, Pergamon Press, Oxford.
Buchanan B. B., Gruissen, W. and R.L. Jones R.L., Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists, USA.
Lehninger, Principles of Biochemistry, Freeman.
Voet & Voet, Biochemistry, Wiley.

Paper Code	Course Title	L	T	P	Cr
AGR 218	Crop Physiology	2	0	2	3

UNIT I

Introduction, Importance in Agriculture. Seed Physiology, Seed structures (Monocot and Dicot seed), Morphological, physiological and biochemical changes during seed development, Physiological maturity – Morphological and physiological changes associated with physiological maturity in crop, Harvestable maturity, Seed viability and vigour, Factors affecting seed viability and vigour. Methods of testing seed viability and vigour, Germination, Utilization of seed reserves during seed germination, Morphological, physiological and biochemical changes during seed germination, Factors affecting seed germination. Growth and Development, Definition, Determinate and Indeterminate growth, Monocarpic and Polycarpic species with examples. Measurement of growth, Growth analysis. Growth characteristics: Definitions and mathematical formulae.

UNIT II

Crop Water Relations: Physiological importance of water to plants, Water potential and its components, measurement of water status in plants. Diffusion Pressure deficit. Transpiration, types and significance. Transpiration in relation to crop productivity. Structure of Stomatal

Complex in Monocot and Dicot species, Mechanism of Stomatal opening and closing. Water absorbing system in plants. Ascent of Sap. Water Use Efficiency in C_3, C_4 and CAM plants. Factors affecting WUE. Translocation of assimilates, Phloem loading, apoplastic and symplastic transport of assimilates, Source and sink concept. Nutriophysiology – Definition – Physiology of nutrient uptake, Functions of plant nutrients – Deficiencies and toxicity symptoms of plant nutrients. Foliar nutrition, Hydroponics. Introduction of Photoperiodism and Vernalisation in relation to crop productivity – Photoperiodism.

UNIT III

Photosynthesis, Energy synthesis, Significance of C_3, C_4 and CAM pathway, Relationship of Photosynthesis and crop productivity, Photorespiration, Factors affecting Photosynthesis and productivity, Methods of measuring photosynthesis, Photosynthetic efficiency, Dry matter partitioning, Harvest index of crops. Respiration and its significance, Brief account of Growth respiration and maintenance respiration, Alternate respiration – Salt respiration – wound respiration – measurement of respiration.

UNIT IV

Plant Growth Regulators – Occurrence, Biosynthesis, Mode of action of action, structure, physiological roles of Auxins, Gibberellins, Cytokinins, ABA, Ethylene and Novel plant growth regulators, Commercial application of plant growth regulators in agriculture. Senescence and abscission - Definition – Classification – Theories of mechanism and control of senescence – Physiological and biochemical changes and their significance. Post Harvest Physiology - Seed dormancy – Definition – types of seed dormancy – Advantages and disadvantages of seed dormancy – Causes and remedial measures for breaking seed dormancy, Optimum conditions of seed storage – Factors influencing seed storage (ISTA standards). Fruit ripening - Metamorphic changes – Climateric and non-climateric fruits – Hormonal regulation of fruit ripening (with ethrel, CCC, Polaris, paclobuterozole).

Practical: Preparation of solutions. Growth analysis, Calculation of growth parameters; Seed structure of monocots and dicots and seed germination; Demonstration of imbibitions and osmosis; Imbibition of seed; Optimum conditions for seed germination; Measurement of absorption spectrum of chloroplastic pigments; Measurement of leaf area by various methods; Stomatal frequency and index; Leaf anatomy of C_3 and C_4 plants; Transpiration; Breaking seed dormancy; Yield analysis; Seed viability and vigour tests; Effect of plant growth regulators.

Suggested Readings:

Malik C.P. Plant Physiology
Dutta S.C., Plant Physiology
Shrivastava H.S. Plant Physiology
Milthorpe, F.L. and Moorley, J. An introduction to crop physiology
Gardner, T.P., Pearce, R.B. & Mitchell, R.L. Physiology of Crop Plants
Maiti, R.K., N.C. Sarkar and V.P. Singh. Principles of Post-Harvest Seed Physiology and Technology

Paper Code	Course Title	L	T	P	Cr
AGR 126	Agricultural Microbiology	2	0	2	3

UNIT I

History of Microbiology: Spontaneous generation theory, Role of microbes in fermentation, Germ theory of disease. Protection against infections. Applied areas of Microbiology. Metabolism in bacteria: ATP generation, chemoautotrophy, photo autotrophy, respiration, fermentation.

UNIT II

Bacteriophages: Structure and properties of Bacterial viruses; Lytic and Lysogenic cycles. Viroids and Prions. Bacterial genetics: Gene expression, Genetic recombination; transformation, conjugation and transduction, genetic engineering, Plasmids, episomes, genetically modified Organisms.

UNIT III

Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur. Biological nitrogen fixation. Microflora of Rhizosphere and Phyllosphere, microbes in composting. Microbiology of Water. Microbiology of food: microbial spoilage and principles of food preservation.

UNIT IV

Beneficial microorganisms in Agriculture: Biofertilizer (Bacterial Cyanobacterial and Fungal), microbial insecticides, Microbial agents for control of Plant diseases, Biodegradation, Biogas production, Biodegradable plastics, Plant-Microbe interactions.

Practical: General instructions, Familiarization with instruments, materials, glassware etc. in a microbiology laboratory. Methods of Sterilization and Preparation of media I- Preparation of nutrient broth, nutrient agar plates, nutrient agar slant and nutrient agar stabling. Plating methods for Isolation and Purification of bacteria. Isolation of bacteria by Streak plate method. Checking of purity of a bacterial culture by Streak plating method. Identification of bacteria by staining methods and Biochemical tests. Enumeration of bacteria: Enumeration of bacteria by Pour plate method and Spread plate method.

Suggested Readings:

Dubey, R.C., and Maheshwari, D.K., A text book of Microbiology, S. Chand & Company Ltd, New Delhi, 2010.

Darralyn M., David S.and Phillip A., Introduction to microbiology. Black Well Publication Ltd. USA, 2001.

Instant Notes; Microbiology by J. Nicklin, K.Graeme-Cook and R. Killington, BIOS Publications

Salle, A.J., Fundamentals Principles of bacteriology. MacGraw Hill, Inc., 1974.

Paper Code	Course Title	L	T	P	Cr
EVS 151	Environmental Science	1	0	2	2

UNIT I

Scope and importance of environmental studies. Natural resources: Renewable and renewable resources. Forest, Water, Food, energy and land resources. Ecosystems: Definition, concept, structure and functions. Producers, consumers and decomposers of an ecosystem. Energy flow in the ecosystem. Types of ecosystems.

UNIT II

Bio-diversity: Definition, classification, threats to biodiversity and its conservation. Environmental pollution: Causes, effects and control of air, water, soil, thermal, noise and marine pollution. Causes, effects and management of soil nuclear hazards and industrial wastes.

UNIT III

Disaster management, Floods, earthquakes, cyclones and landslides. Social issues and the environment, unsustainable to sustainable development.

UNIT IV

The Environment Protection Act, The Air Act, The water Act, The Wildlife Protection. Act and Forest Conservation Act. Woman and child welfare, HIV/AIDS and Role of information technology on environment and human health.

Practical: Collection, processing and storage of effluent samples; Determination of Bio- Chemical oxygen demand (BOD) in effluent sample; Determination of chemical oxygen demand (COD) in effluent sample; Estimation of respirable and non-respirable dust in the air by using portable dust sampler; Determination of total dissolved solids (TDS) in effluent samples; Estimation of species abundance of plants; Estimation of nitrate contamination in ground water; Analysis of temporary and total hardness of water sample by titration; Estimation of pesticide contamination in Agro-Ecosystem; Visit to Social Service Organization / Environmental Education Centre.

Suggested Readings:

Agrawal K.C. Fundamentals of Environmental Biology
Sharma P.D. Ecology and Environment
Dhaliwal, G.S. and Kukal, S.S. Essentials of Environmental Science
Sharma P.D. Environmental Biology
Dharkar R. Environmental Studies

DAV UNIVERSITY, JALANDHAR

STATISTICS AND COMPUTER APPLICATION

Paper Code	Course Title	L	T	P	Cr
ECO 151	Statistics	1	0	2	2

UNIT I

Introduction: Definition of Statistics and its use and limitations; Frequency Distribution and Frequency Curves; Measures of Central Tendency: Characteristics of Ideal Average, Arithmetic Mean; Median, Mode, Merits and Demerits of Arithmetic Mean; Measures of Dispersion: Standard Deviation, Variance and Coefficient of Variation; Probability: Definition and concept of probability; Normal Distribution and its properties;

UNIT II

Introduction to Sampling: Random Sampling; the concept of Standard Error; Tests of Significance- Types of Errors, Null Hypothesis, Level of Significance and Degrees of Freedom, Steps involved in testing of hypothesis; Large Sample Test- SND test for Means, Single Sample and Two Samples (all types); Small Sample Test for Means, Student's t-test for Single Sample, Two Samples and Paired t test. F test; Chi-Square Test in 2x2 Contingency Table, Yates' Correction for continuity

UNIT III

Correlation: Types of Correlation and identification through Scatter Diagram, Computation of Correlation Coefficient 'r' and its testing. Linear Regression: of Y on X and X on Y. Inter-relation between 'r' and the regression coefficients, fitting of regression equations.

UNIT-IV

Experimental Designs: Basic Designs, Completely Randomized Design (CRD), Layout and analysis with equal and unequal number of observations, Randomized Block Design (RBD), Layout and analysis, Latin Square Design (LSD), Layout and analysis.

Suggested Readings:

Panse, V.G., Shaw, F.J., and Sukhatme, P.V., Statistical methods for agricultural workers, Indian Council of Agricultural Research, 1967.

Fisher, R.A., Statistical methods for research workers (14th Edition), Hafner Press, UK, 1975.

Singh, S., Singh, T.P., Babsal, M.L., and Kumar R., Statistical Method for Research workers Kalyani Publishers, Ludhiana, 2004.

Paper Code	Course Title	L	T	P	Cr
CSA159	Workshop on Office Automation	0	0	4	2

UNIT-I

Computer Fundamentals and Number System

- Block Structure of a Computer
- Characteristics of Computers
- Generations of Computers, Uses of Computers
- Classification of Computers
- Input-Output Devices, Memory and Mass Storage Devices
- Application and System Software

UNIT-II

Word Processing

- Introduction, Parts of Word Window, Saving, Printing, Resaving, Closing a Document, Creating another Document, Exiting Word.
- Editing and Formatting a Document, Text Formatting, Paragraph Formatting, Headers and

Footers

- Undoing and Redoing Changes
- Selecting, Deleting, and Replacing Text, Find and Replace Commands.
- Checking Spelling and Grammar; On-line Spelling and Grammar correction using Auto correct, Auto Text, Using Thesaurus, Using Clip Gallery
- Inserting Graphics From files, Working with Tables - Entering Text in the Table, Creating Table, Changing Format of Text of cells, Changing Column width and Row height, Formatting Table Border
- Working with Tables, Creating Tables, Entering Text, Moving Around in a Table, Selecting Text in Tables, Formatting and Resizing Tables.
- Using Mail Merge - Mail Merge Procedure, Printing a document

UNIT-III

Spreadsheets

- Introduction, Parts of Excel Window, Creating a New Workbook, Printing a Worksheet, Resaving, Closing, Creating another Workbook, Exiting Workbook.
- Basic Operations - Arithmetic operators, Comparison operators, Text operator & (ampersand) Reference operator, performing Calculations using Formulae and Functions.
- Modifying the worksheet layout - Changing Width of Column, Changing Height of Row, Deleting Rows/Columns/Cells, Moving and copying contents of cell, Alignment of text in the cell
- Working with functions - Date and time function, Statistical function, Financial function, Mathematical and Trigonometric functions, Lookup and Reference Functions, Data Base functions, Text function, Logical functions
- Printing the workbook - Setting up Print Area, Setting up Margins, Defining Header and Footer, Controlling Gridlines
- Introduction to CHARTS - Formatting Charts

UNIT-IV

Presentations

- Creating a Presentation Slide, Design Templates And Blank Presentations, Power Point Standard Toolbar Buttons
- Changing Font, Font Size and Bold; Moving The Frame and Inserting Clip Art; Different Slide Layouts; Formatting The Slide Design; Work With The Slide Master; Saving The Presentation
- The Auto Content Wizard; Using Existing Slides; Using the Different Views of a Slide, Adding Transitions and Animation, Running Slide Show

Suggested Readings:

Kumar, K. and Rajkumar R., Computer Applications in Business, Tata McGraw Hill
Kogent Learning Solutions Inc, Office 2010 in Simple Steps, DreamTech Press
Goel A., Computer Fundamentals, Pearson
Silberschatz & Korth A., Database System Concepts, New York, McGraw-Hill
Simpson, A., Robinson, C., Mastering Access 2000, New Delhi, BPB
Taxali, R. K., P C Software Made Simple, New Delhi, Tata McGraw-Hill

DAV UNIVERSITY, JALANDHAR

ANIMAL PRODUCTION

Paper Code	Course Title	L	T	P	Cr
AGR 216	Livestock Production and Management	2	0	2	3

UNIT-I

Place of livestock in the national economy, different livestock development programmes of Govt. of India. Important exotic and Indian breeds of cattle, buffalo, sheep, goat and swine.

UNIT-II

Measures and factors affecting fertility in livestock, reproductive behaviour like oestrus, parturition, farrowing etc. Milk secretion, milking of animals and factors affecting milk yield and composition.

UNIT-III

Selection and breeding of livestock for higher milk and meat production. Feeding and management of calves, growing heifers and milch animals and other classes and types of animals, housing principles, space requirements for different species of livestock.

UNIT-IV

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

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

Suggested Readings:-

Singh, H., Handbook of Animal Husbandry, I.C.A.R. Publications, New Delhi, 2005.
Eigan, W.M., and Paul, R., Dairy cattle feed, Johan Willey & Sons, New York, 2005.
Kumar, A., Animal Husbandry, Discovery Publishing House, New Delhi, 2006.

DAV UNIVERSITY, JALANDHAR

ENGLISH

Paper Code	Course Title	L	T	P	Cr
ENG 153 A	Comprehension and Communication Skills in English	3	0	2	4

UNIT I

Comprehension: Text for comprehension, Current English for Colleges, By N. Krishnaswamy & T.Sriraman, Macmillan India Limited, Madras, 1995; War Minus shooting The sporting spirit George Orwell (a) Reading Comprehension (b) Vocabulary – Synonyms – Antonyms – Often confused words and (c) Two exercises to help the students in the enrichment of vocabulary based on TOEFL and GRE and other competitive examinations.

UNIT II

A Dilemma – A layman looks at science Raymond B. Fosdick (a) Reading Comprehension (b) Vocabulary – Homonyms and Homophones (c) Exercises on Figurative Language & Idiomatic Language (E.g.: dust and ashes, doorstep of doom, boundaries of knowledge, Apple of one's eye, in a fix etc).

UNIT III

You and Your English – Spoken English and Broken English G.B. Shaw (a) Reading Comprehension (b) Language study, Functional Grammar, Agreement of verb with subject. Written Skills: Mechanics of good letter, Effective business correspondence, Personal Correspondence, Preparation of Curriculum vitae and Job applications.

UNIT IV

The Style, Importance of professional writing –Choice of words and Phrases, precision, conciseness clichés, redundancy, jargon, foreign words, precise writing and synopsis writing. Interviews, Types of interviews, purpose, different settings, as interviewer, interviewee, physical makeup and manners, appearance, poise, speech, self-reliance, Evaluation process, Review or feedback.

Practical: Listening Comprehension: Listening to short talks, lectures, speeches (scientific, commercial and general in nature) Practical: listening to at least two tape, recorded conversations aimed at testing the listening comprehension of students; Communication: Spoken English, oral communication, importance stress and intonation. Practical: Spoken English practice by using audiovisual aids, the essentials of good conversations, oral exercises in conversation practice (At the Doctor, at the Restaurant, at the Market Yard); Oral Presentation of Reports: Seminars and conferences, features of oral presentation, regulating speech, physical appearance, body language posture, eye contact, voice, audience, preparation of visual aids. Practical: One presentation by individual on the given topic related to agriculture like W.T.O, Developing new technologies in Agriculture, Bio fertilizers etc.; Evaluation of a Presentation: evaluation sheet, other strategies to be considered for evaluating a presentation, Practical: Mock evaluation of a presentation; Dyadic communication, face to face conversation, Telephonic conversation, rate of speech, clarity of voice, speaking and listening politeness, telephone etiquette, Practical: Practice of Telephonic conversation; Reading skills, using Dictionary, reading dialogues, rapid reading, intensive reading, improving reading skills; Meetings: purpose, procedure participation, chairmanship, physical arrangements, recording minutes of meeting; Practice of Presentation by using power point and LCD projector; Conducting Mock interviews – testing initiative, team spirit, leadership, intellectual ability – potential for development, memory, motivation, objectives, aptitude etc., Group Discussions and Debates on current topics; Review or Feed Back; Practical examination.