ADOPTION OF 4th DEANS COMMITTEE RECOMMENDATION IN IGKV, RAIPUR w. e .f. ACADEMIC SESSION 2008-09 (EMR- 30th July 2008 , 69th BOM 4th August 2008 and 62nd ACM- 12th September 2008)

DISTRIBUTION OF COURSES FOR B.Sc. (Ag.)

SECOND YEAR

1st Semester

1.	APB 211	Principles of Plant Breeding	3	2	1
2.	AGRO 211	Field Crops - I	3	2	1
3.	AEC 211	Agricultural Finance and Cooperation	2	1	1
4.	AST 211	Statistics Methods	3	2	1
5.	APP 211	Field Crop Diseases and Management	3	2	1
6.	AENT 211	Insect Ecology, Integrated Pest Management & Beneficial Insects	3	2	1
7.	PPH 211	Crop Physiology	3	2	1
8.	AEXT 211	Entrepreneurship development and Communication Skills	2	1	1
			22	**14**	**8**

2nd Semester

1.	AGRO 221	Water Management	2	1	1
2.	APB 221	Breeding of Field & Horticultural Crops	3	2	1
3.	AEC 221	Agricultural Marketing, Trade and Prices	2	1	1
4.	APP 221	Diseases of Horticultural Crops and Management	3	2	1
5.	AVET 221	Live-stock Production and Management	3	2	1
6.	ASOIL 221	Soil Chemistry, Fertility and Nutrient Management	3	2	1
7.	AST 221	Introduction to Computer Applications	2	1	1
8.	AHORT 221	Spices, Aromatic, Medicinal and Plantation Crops	3	2	1
9.	AGRO 222	Practical Crop Production - II	1	0	1
			22	**13**	**9**

COURSE TITLE : PRINCIPLES OF PLANT BREEDING
COURSE No : APB-211
CREDIT HOURS : 3 (2+1)
YEAR/SEMESTER : 2nd YEAR / 1st SEMESTER

Theory:
Classification of plants, Botanical description, Floral biology, Emasculation and Pollination techniques in cereals, millets, pulses, oil seeds, fibers, plantation crops etc. Aims and objectives of Plant Breeding; Modes of reproduction, Sexual, Asexual, Apomixis and their classification; Significance in plant breeding; Modes of pollination, genetic consequences, differences between self and cross pollinated crops; Methods of breeding – introduction and acclimatization. Selection, Mass selection Johannson's pure line theory, genetic basis, pure line selection; Hybridization, Aims and objectives, types of hybridization; Methods of handling of segregating generations, pedigree method, bulk method, back cross method and various modified methods; Incompatibility and male sterility and their utilization in crop improvement; Heterosis, inbreeding depression, various theories of Heterosis, exploitation of hybrid vigour development of inbred lines, single cross and double cross hybrids; 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:
1. Botanical description and floral biology Rice and Sorghum; Maize and Wheat; Bajra and Ragi; Sugarcane and Coconut; Groundnut, Castor, Safflower and Sesamum; Redgram, Bengalgram and Greengram; Soybean and blackgram; Chillies, Brinjal and Tomato; Bhendi, Onion, Bottle-gourd and Ridge-gourd; Cotton and Mesta; Jute and Sunhemp
2. Study of megasporogenesis and microsporogenesis
3. Fertilization and life cycle of an angiospermic plant
4. Plant Breeder's kit; Hybridization techniques and precautions to be taken
5. Floral morphology, selfing, emasculation and crossing techniques
6. Study of male sterility and incompatibility in field plots;

References:

1. Essentials of Plant Breeding, By Singh, Phundan, Kalyani Publishers Ludhiana/ New Delhi.
2. Plant Breeding, Singh, B.D. Kalyani Publishers. New Delhi / Ludhiana.
3. Principles of Plant Breeding, Allard, R.W.
4. Practical Manual in Plant breeding, Singh, R.K. and Singh B.D. Kalyani Publishers. New Delhi/ Ludhiana.
5. Breeding asian Field Crops, Poehlman, J.N. and Borthakur, D.N., Oxford and IBH Pub. Co., New Delhi, (English & Hindi Edition)
6. पादप प्रजनन सिद्धांत एवं विधियां– बी. डी. सिंह, कल्याणजी पब्लिशर्स, लुधियाना
7. प्रारंभिक पादप प्रजनन– फेड एवं ब्रिग्ज एवं पी. एफ. नोल्स अनुवाद एवं प्रकाशन निदेशालय, गोबिन्द बल्लभ पन्त कृ ा एवं प्रौद्योगिक विश्वविद्यालय, पन्तनगर (नैनीताल)

COURSE TITLE	**:**	**FIELD CROPS - I**
COURSE No	:	AGRO-211
CREDIT HOURS	:	3 (2+1)
YEAR/SEMESTER	:	2nd YEAR / 1st SEMESTER

Theory:

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; Pulses : pigeonpea, mungbean and urdbean; Oilseeds: soybean, groundnut, sesame, niger and castor; Fibre crops: cotton, jute and sunhemp; and Forage crops: sorghum, maize, cowpea, cluster bean and napier.

Practical:

1. Rice nursery preparation and transplanting/seed bed preparation and sowing of *Kharif* crops- soybean, pigeonpea, mungbean, maize, groundnut, and cotton.
2. Effect of seed size on germination and seedling vigour of soybean/groundnut.
3. Effect of sowing depth on germination of different *Kharif* crops.
4. Identification of weeds in *Kharif* crops.
5. Calculation of fertilizer requirement and their application in *Kharif* crops.
6. Study of growth and yield contributing characters and yield estimation.
7. Study of crop varieties and important agronomic experiments.
8. Working out cost of cultivation.

References:

1. Bharat ki Fasle – Chhidda Singh and Om Prakash.
2. Bharat ki Pramukh Fasle – Kalicharan Sharma.
3. Kharif and Rabi ki Fasle – Om Prakash.
4. Sasya Vigyan – Jagannath Singh.
5. Hand Book of Agriculture: ICAR.
6. Scientific crop production: C. Thakur.
7. Field Crops: Y.M. Iyer.
8. Cereal Crops: W.H. Leonard and J.H. Martin.

COURSE TITLE	**:**	**AGRICULTURAL FINANCE AND CO-OPERATION**
COURSE No	:	AEC-211
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	2nd YEAR / 1st SEMESTER

Theory :

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. 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. 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, 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.

Practical: Factors governing use of Capital and identification of credit needs; 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.

References:

1. Kahion, A.S. and Karam Singh, Managing Agricultural Finance Allied Publishers Pvt., Ltd., New Delhi.
2. Johl S.S. and Moore C. V. Essentials of Farm Financial Management. Today and tomorrow's Printers and publishers.
3. Mathur B.S., Cooperation in India. Sahitya Bhawan, Agra, New Delhi.
4. Kamat, G.S. (1978). New Dimension of Co-operative Management, Himaliyan Publishing House, Bombay.
5. Krishnaswami, O.R. (1978). Fundamentals of Cooperation, S. Chand & Company Ltd., New Delhi
6. Lee. F. Warren, Aaron G. Nelson and W.G. Murray (1980). Agricultural Finance. Iowa State University Press Ames. Iowa.
7. Pandey, U.K. (1990). An Introduction to Agricultural Finance, Kalyani Publishers, New Delhi.
8. Reddy, S. and Raghu Ram, P. (1980). Agricultural Finance and Management, Oxford and IBH, New Delhi.

COURSE TITLE	**:**	**STATISTICS METHODS**
COURSE NO.	:	AST-211
CREDIT HOURS	:	3 (2+1)
YEAR /SEMESTER	:	2nd year 1st Semester

Theory:

Introduction: Definition of Statistics and its use and limitations; Frequency Distribution and Frequency Curves

Measures of Central Tendency: Characteristics of Ideal Average, Arithmetic Mean; Merits and Demerits of arithmetic Mean.

Measures of Central Tendency: Median, Mode

Measures of Dispersion: Standard Deviation, Variance and Coefficient of Variation.

Probability: Definition and concept of probability

Normal Distribution and its properties

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

Large Sample Test-SND test for Means Two Samples (all types)

Small Sample Test for Means- Student's t-test for Single Sample and two samples

Small Sample Test : F test

Chi-Square Test in 2×2 Contingency Table, Yates Correction for continuity

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, Properties of regression coefficients

Fitting of regression equation

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

Practical:

S.No.	Practical topics
1	Construction of Frequency Distribution Tables and Frequency Curves
2	Computation of Arithmetic Mean for Grouped and Un-Grouped data
3	Computation of Median for Un-Grouped and Grouped data
4	Computation of Mode for Un-Grouped and Grouped data
5	Computation of Standard Deviation, Variance and Coefficient of Variation for Un-Grouped and Grouped data
6	Large samples: SND test for Means, Single Sample
7	Large samples: SND test for Means, Two Samples
8	Student's t-test for Single Sample, two samples (Paired and independent)

9 F test
10 Chi- Square Test in 2 x2 Contingency Table, Yates Correction for continuity
11 Computation of Correlation Coefficient 'r' and its testing
12 Fitting of regression equation-Y on X and X on Y
13 Analysis of Completely Randomized Design (CRD) (Equal and unequal repetition of observations)
14 Analysis of Randomized Block Design (RBD)
15 Analysis of Latin Square Design (LSD).

References:

1. Fundamentals of Statistical Methods — S.C. Gupta & V.K. Kapoor
2. Fundamentals of Applied Statistics — S.C. Gupta & V.K. Kapoor
3. सांख्यिकी के सिद्धांत — एस.एम. शुक्ला एवं एस.पी. सहाय
4. सांख्यिकी के सिद्धांत — डी.एन. एलहन्स एवं एम.पी वैश्य
5. Elementary Statistical Methods — S.P. Gupta
6. सांख्यिकी — के.के. रस्तोगी

COURSE TITLE : FIELD CROP DISEASES AND MANAGEMENT
COURSE No : APP-211
CREDIT HOURS : 3 (2+1)
YEAR/SEMESTER : 2nd YEAR / 1st SEMESTER

Theory :

Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of rice (**blast, brown spot, sheath blight bacterial blight**), sorghum(**smuts**), bajra (**green ear, ergot**), maize (**leaf blight**) wheat (**rusts, loose smut karnal bunt**), sugarcane (**red rot, whip smut**), turmeric (leaf spot), tobacco (**mosaic**), groundnut (**leaf spot, rust, bud necrosis**), sesamum (**phyllody**), sunflower (**head rot, alternaria blight**) mustard (**white rust, leaf spot**) linseed (**powdery mildew, rust wilt**), cotton (**angular leaf spot, wilt**) redgram(wilt, **sterility mosaic**), bengalgram (**wilt collar rot, root rot)**, blackgram (**powdery mildew**, **mosaic**), greengram (**powdery mildew, yellow mosaic, leaf spot)** pea (**rust, powdery mildew**), and soybean **(bacterial pustule, yellow mosaic budnecrosis).**

Practical: Study of symptoms, etiology, host-parasite relationship and specific control measures of the following crop diseases. Presentation of disease samples survey and collection of Diseases of rice, sorghum; Diseases of wheat, bajra & maize; Diseases of sugarcane, turmeric & tobacco; Diseases of groundnut, sunflower; Diseases of sesamum & cotton; Diseases of redgram, greengram, blackgram, bengalgram & beans; Field visits at appropriate time during the semester

Note: Students should submit 50 pressed, well mounted diseased specimens in three installments during the semester.

References:

1. Pod rog shastra - S.M. Kumar
2. Pod rog vigyan - B.P. Singh
3. Plant diseases - R.S. Singh
4. Plant Pathology - R.S. Mehrotra
5. Diseases of Crop Plants in India - G. Rangaswami

COURSE TITLE : INSECT ECOLOGY, INTEGRATED PEST MANAGEMENT & BENEFICIAL INSECTS.

COURSE NO. : AENT-211

CREDIT HOURS : 3 (2+1)

YEAR/ SEMESTER : 2nd YEAR/ 1st SEMESTER

Theory:

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors- temperature, moisture, humidity, rainfall light, atmospheric pressure and air currents. Effect of biotic factors- food competition, natural and environmental resistance and Concept of Balance of life in nature, biotic potential and environmental resistance and causes for out break of pests in agro-ecosystem. Pest surveillance and pest forecasting. Categories of pests. IPM; Introduction, importance, concept, principles and tools of IPM – Host plant resistance, Cultural, Mechanical, Physical, Legislative, Biological (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses), methods of control. Chemical control – importance, hazards and limitations. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Study of important insecticides. Botanical insecticides – neem based products, Cyclodiens, Organophosphates, Carbamates, Synthetic pyrethroids, Novel insecticides, Pheromones, Nicotinyl insecticides, Chitin synthesis inhibitors, Phenyl pyrazoles, Avermectins, Macrocyclic lactones, Oxadiazimes, Thiourea derivaties, pyridine azomethines, pyrroles etc. Nematicides, Rodenticides, Acaricides and fumigants. Recent methods of pest control. Practices, scope and limitations of IPM. Insecticides Act 1968 – Important provisions. Application techniques of spray fluids. Phytotoxicity of insecticides. Symptoms of poisoning, first aid and antidotes. Beneficial insects: parasites and predators used in pest control and their mass multiplication techniques. Important groups of microorganisms, bacteria, viruses and fungi used in pest control and their mass multiplication techniques. Important species of pollinators, weed killers and scavengers - their importance. Non insect pests – mites, nematodes, rodents and birds. Vermiculture

Practical : Visit to meteorological observatory / automatic weather reporting station; Study of terrestrial and pond ecosystems of insects; Studies on behaviour 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; Practicable IPM practices, Cultural and biological methods, Chemical control, Insecticides and their formulations; Calculation of doses/concentrations of insecticides; Compatibility of pesticides and Phytotoxicity of insecticides; IPM case studies; Identification of common phytophagous mites and their morphological characters; Identification of common plant parasitic nematodes and their morphological characters; Identification of rodents and bird pests and their damage; Identification of earthworms in vermiculture –visit to vermiculture unit; Other beneficial insects- Pollinators, weed killers and scavengers.

Reference:

1. General and Applied Entomology- B.V. David and T.N. Ananthkrishnan.
2. Agricultural Entomology for Indian Students- Khanna, S.S.
3. Agricultural Entomology – Mathur and Upadhyay.
4. Krishi Keet Vigyan – Sharma, J.P.
5. Applied Entomology by P.G. Ferumone and Alka Prakash.
6. A text book of applied Entomology Vol. I & II- K.P. Shrivastava.
7. Pesticide application equipments – O.S. Bindra & Harcharan Singh.
8. Introduction to Insect Pest Management-
   Metcalf, R.L. and Luchmann, W. John Willy and Sons Pub.

COURSE TITLE	**:**	**CROP PHYSIOLOGY**
COURSE NO.	:	PPH-211
CREDIT HOURS	:	3 (2+1)
YEAR/ SEMESTER	:	2^{nd} YEAR/ 1^{st} SEMESTER

Theory:

Introduction, Importance in Agriculture. Seed Physiology, Seed structures, 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. Crop Water Relations, Physiological importance of water to plants, Water potential and its components, measurement of water status in plants. Transpiration, significance, Transpiration in relation to crop productivity, Water Use Efficiency, WUE in C_3, C_4 and CAM plants, Factors affecting WUE. Photosynthesis, Energy synthesis, Significance of C_3, C_4 and CAM pathway, Relationship of Photosynthesis and crop productivity, Translocation of assimilates, Phloem loading, apoplastic and symplastic transport of assimilates, Source and sink concept, 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. Nutriophysiology – Definition – Mengel's classification of plant nutrients – Physiology of nutrient uptake – Functions of plant nutrients – Deficience and toxicity symptoms of plant nutrients – Foliar nutrition – Hydroponics. Introduction of Photoperiodism and Vernalisation in relation to crop productivity – Photoperiodism Plant Growth Regulators – Occurrence – Biosynthesis – Mode of action of Auxins, Gibberellins, Cytokinins, ABA, Ethylene. 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; Methods of measuring water status in roots, stems and leaves; Measurement of water potential by Chardakov's method; Measurement of absorption spectrum of chloroplastic pigments and fluorescence; Measurement of leaf area by various methods; Stomatal frequency and index – Respirometer – Measurement of respirometer; Leaf anatomy of C_3 and C_4 plants; Transpiration of measurement; Imbibition of seed; Optimum conditions for seed germination; Breaking seed dormancy; (a) Chemical method (b) Mechanical method; Yield analysis; Seed viability and vigour tests; Effect of ethylene on regulation of stomata.

Reference:

1 Plant Physiology : S.N. Pandey & B.K. Sinha
2 Plant Physiology : P.S. Gill
3 Plant Physiology : H.S. Shrivastava
4 Fundamentals of Plant Physiology : V.K. Jain
5 A Text Book of Plant Physiology : V. Verma
6. Plant Physiology : Frank B. Salisbury and Clean W. Rose
7. Plant Physiology : RM Devlin & F.S. Withan
8. Plant Physiology : RGS Bidwell
9 पादप शरीर क्रिया–विज्ञान : एस.एन. पाण्डेय एवं मीता पाण्डेय
10 कृषि वनस्पति विज्ञान, पादप शरीर क्रिया विज्ञान, शरीर रचना एवं सस्य वर्गीकृत :
वीर सिंह पंवार
11 पादप शरीर क्रिया–विज्ञान : डॉ. विक्रमादित्य वर्मा

COURSE TITLE : ENTREPRENEURSHIP DEVELOPMENT AND COMMUNICATION SKILLS

COURSE No : AEXT-211

CREDIT HOURS : 2 (1+1)

YEAR/SEMESTER : 2nd YEAR / 1st SEMESTER

Theory:

Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalisation and the emerging business / entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises (SMEs) / SSIs. Export and Import Policies relevant to agriculture sector. Venture capital. Contract farming and joint ventures, public-private partnerships. Overview of agri inputs industry. Characteristics of Indian agricultural processing and export industry. Social Responsibility of Business. Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical: Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentations.

Reference:

1. Akhouri, M.M.P., Misra, S.P. and Sengupta, Rita (1989). Trainers Manual on Developing Entrepreneurial motivation, NIESBUD, New Delhi.
2. Betty Gordan B.(1979). Entrepreneurship, Playing to win, Taraporewala, Bombay.
3. Entrepreneurship Development Institute of India (1987). Developing New Entrepreneurs EDII, Ahmedabad, NISIET Library: 338.93/EDI/87/25104.
4. Mancuso, Josheph (1974). The Entrepreneurs Handbook Vol. I & 2 Artech House Inc. USA.
5. Patel V.G. (1987) Entrepreneurships Development Programme in India and its relevance to Developing Countries, Entrepreneurship Development Institute of India, Ahmedabad, NISIET Library: 338.93(540)/PAT/87/25103.
6. Rao, T.V.(1974) Development of an Entrepreneur's Behaviouristic Model, Technical Paper no. 51, (Mimeographed), Ahmedabad, Indian Institute of Management.

COURSE TITLE	**:**	**WATER MANAGEMENT**
COURSE No	:	AGRO-221
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	2nd YEAR / 1st SEMESTER

Theory:

Irrigation- definition and objectives, water resources and irrigation development in India and Chhattisgarh; Soil plant water relationships (concept and basic terms); Methods of soil moisture estimation, evapotranspiration and crop water requirement; effective rainfall, scheduling of irrigation; Methods of irrigation: surface, subsurface, sprinkler and drip irrigation; measurement of irrigation water, Irrigation efficiency and water use efficiency, conjunctive use of water, irrigation water quality and its management. Water requirements of different crops. Watershed management- definition and concept. Drainage- importance and methods.

Practical:

1. Determination of bulk density, soil moisture content by gravimetric method, tensiometer, electrical resistance block and moisture meter.
2. Determination of field capacity and infiltration rate.
3. Measurement of irrigation water through flumes and weirs.
4. Calculation of irrigation water requirement (Problems).
5. Demonstration of different methods of irrigation.
6. Visit to farmers field and cost estimation of drip irrigation system.
7. Demonstration of filter cleaning, fertigation, injection and flushing of laterals.
8. Measurement of emitter discharge rate, wetted diameter and calculation of emitter discharge variability.
9. Erection and operation of sprinkler irrigation system;
10. Determination of water quality parameters (EC, pH).

References:

1. Irrigation: Theory & Practices by A.M. Michael.
2. Water Management: Priniciples and Practies by R.A. Singh and S.R. Singh.
3. Irrigation by A.M. Michael and T.P. Ojha.
4. Conserving Soil – By M.P. Butler.
5. Elements of Soil conservation by H.H. Bennett.
6. Soil conservation in India by Rama Rao.
7. Hand Book of Agriculture – ICAR Publication.
8. Introduction to agronomy and soil and water management by V.G. Vaidya and K.R. Sahatrabudhe.
9. Irrigation practice and Water Management by L.D. Doneen and D.W. Westcot, FAO, 1984.

COURSE TITLE : BREEDING OF FIELD & HORTICULTURAL CROPS
COURSE No : APB-221
CREDIT HOURS : 3 (2+1)
YEAR/SEMESTER : 2^{nd} YEAR / 2^{nd} SEMESTER

Theory:

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Hardy-Weinberg Law; Study in respect of origin, distribution of species, wild relatives and forms, Cereals, (rice, wheat, maize, millets, sorghum, bajra, ragi); Pulses (redgram, greengram / blackgram, soybean); Oilseeds (Groundnut, sesame, sunflower, safflower, castor, mustard) etc. Fibers (Cotton, kenaf, roselle, jute) etc. Major breeding procedures for development of hybrids / varieties of various crops; 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 unfavourable environments; Definition of biometrics, assessment of variability i.e., additive, dominance and epistasis and their differentiation; Genotype x Environment interaction and influence on yield/performance. IPR and its related issues. Vegetables (Tomato, bhindi, chilli, cucumbers); Flowers crops (Chrysanthemum, rose, galardia, gerbera & marigold); Fruit crops (aonla, guava, mango, custard apple, banana, papaya); Major breeding procedures for development of hybrids / varieties of various crops.

Practical:

1. Emasculation and Hybridization techniques.
2. Handling of segregating generations, pedigree methods.
3. Handling of segregating generations, bulk methods.
4. Handling of segregating generations, back cross methods.
5. Field lay out of experiments; Field trials, maintenance of records and registers.
6. Estimation of Heterosis and inbreeding depression.
7. Estimation of Heritability, GCA and SCA.
8. Estimation of variability parameters.
9. Parentage of released varieties/hybrids.
10. Problems on Hardy, Weinberg Law.
11. Study of quality characters.
12. Sources of donors for different characters.
13. Visit to seed production and certification plots.
14. Visit to AICRP trials and programmes.
15. Visit to grow out test plots; Visit to various research stations; Visit to other institutions.
16. Emasculation and Hybridization techniques; Handling of segregating generations, pedigree methods; Handling of segregating generations, bulk methods; Handling of segregating generations, back cross methods; Field lay out 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 AICRP trials and programmes; Visit to grow out test plots; Visit to various research stations; Visit to other institutions

Reference:

1. Essentials of Plant Breeding , By singh, Phundan, Kalyani Publishers Ludhiana/ New Delhi.
2. Plant Breeding, Singh, B.D. Kalyani Publishers. New Delhi/ Ludhiana.
3. Objectivies in genetics and plant breeding By Singh, Phundan, Kalyani Publishers Ludhiana/ New Delhi.
4. Breeding asian Field Crops, Poehlman, J.N. and Borthakur, D.N. , Oxford and IBH Pub. Co., New Delhi, (English & Hindi Edition).
5. Plant Breeding, theory & practices by V.L. Chopra.

6ण पादप प्रजनन सिद्धांत एवं विधियां– बी. डी. सिंह, कल्याणजी पब्लिशर्स, लुधियाना।

7ण प्रायोगिक पादप प्रजनन, भूपेन्द्र राय, उत्तर प्रदेश हिन्दी ग्रन्थ अकादमी, लखनऊ।

8ण प्रायोगिक वनस्पति विज्ञान– सोमकान्त शर्मा म.प्र. हिन्दी ग्रन्थ अकादमी, भोपाल।

9. Breeding of Horticulture crops : Kumar N. New India Pub. Co.
10. "Seed production technology of vegetables" – Prabhakar Singh and B.S.Asati, Daya Publishing House, New Delhi.
11. "Commercial Flowers" – Bose,T.K. and L.P.Yadav (Eds) 1988. Naya Prokash Calcutta.
12. Vegetable breeding vol. I.II. & III : Dr. G. Kalloo, Panima Education book agency, New Delhi.
13. Fruits tropical and subtropical vol. I & II : T. Bose, S.K. Mitra & D. Sanyal, Naya Udyog, Calcutta.

COURSE TITLE : AGRICULTURAL MARKETING, TRADE AND PRICES
COURSE No : AEC-221
CREDIT HOURS : 2 (1+1)
YEAR/SEMESTER : 3rd YEAR / 2nd SEMESTER

Theory :

Agricultural Marketing: Concepts and Definition, Scope and subject matter, 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. 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. Theories of International Trade: Domestic Trade, Free trade, International Trade, GATT, WTO, Implications of AOA. Market access, Domestic support, Export subsidies, EXIM-Policy & Ministerial conferences. Cooperative Marketing. State Trading. Ware Housing Corporation; Central and State, Objectives, Functions, Advantages. Food Corporation of India: Objectives and Functions. 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.

Practical: 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.

References:

1. Acharya, S.S. and Agrawal, N.L. Agricultural Marketing in India, Oxford and IBH Publishing Co, New Delhi
2. Memoria, C.B. and Joshi, R.L., Principles and Practice of marketing in India, Kitab Mahal, Allahabad.
3. Agrawal, N.L. Bhartiya Krishi Ka Arthtantra, Rajasthan Hindi Granth Academy, Jaipur **(Hindi**).
4. Arora, Vijay Pal Singh, Prakashan Nideshalay, G.B. Pant University of Agriculture & Technology, Pantnagar **(Hindi)**.
5. Kahlon, A.S, and Tyagi R.S. Agricultural Price Policy in India, Allied Publishers Private Limited, New Delhi.
6. Maji, C.C. and Bhattacharya, A, GATT and Agricultural Exports- Hopes and Realities, NCAP, New Delhi.
7. Tripathi .Export in economic growth, International Book House.

8. Singh, Gursharan Kainth, Export potential of Indian Agriculture. Regency Publications, New Delhi.
9. Nagpal, Current, Issues in the World Trsde Policies, International Book House, New Delhi.
10. Kohls, R. L. and N. Uhl. Joseph (1980). Marketing of Agricultural Products, Collier Macmillan, New York.
11. Shephard, G. E. Agricultural Price Analysis. Iowa State University Press, Ames, Iowa.
12. Taha, A and Hamdy (1999). Operations Research : An Introduction. Prentice HaIl, New Delhi

COURSE TITLE : DISEASES OF HORTICULTURAL CROPS AND MANAGEMENT

COURSE No : APP-221
CREDIT HOURS : 3 (2+1)
YEAR/SEMESTER : 2nd YEAR / 2nd SEMESTER

Theory :

Economic Importance, symptoms, cause, disease cycle and integrated management of diseases of: citrus (**canker, gummosis, citrus decline**) mango (**malformation, anthracnose powdery mildew**), banana (**bunchy top, panama wilt, moko disease**), grapevine (**powdery mildew, downy mildew**), papaya (**leaf curl, mosaic, stem rot**), guava (**wilt**), apple (**scab, fire blight**), chilli (**anthracnose, leaf curl**), brinjal (**blight, wilt, little leaf**), zinger (**rhizome rot**), colocasia (**phytopthora blight**), bhendi (**yellow vein mosaic, leaf spot**), coriander (**stem gall**), potato (**early blight, late blight, mosaic**) crucifers, (**club root, black rot**), cucurbits(**powdery mildew, downy mildew**), tomato (**early blight, late blight,leaf curl, wilts**), beans (**yellow mosaic, anthracnose**), (onion purple blotch), coconut (**bud rot, stem bleeding**), betelvine (**phytopthora blight**), coffee (**rust**), tea (**blister blight**), rose (die back, podery mildew), chrysanthemum (root rot , bacterial blight)

Practical: Diseases of beans, citrus, guava, & sapota; Diseases of papaya, banana, pomegranate & ber; Diseases of mango, grapes & apple; Diseases of chilli, brinjal & bhendi; Diseases of potato, tomato & crucifers; Diseases of cucurbits, onion & betelvine; Diseases of oil palm, coconut, tea, coffee; Diseases of rose, chrysanthemum. Field visits at appropriate time during the semester.
Note: Students should submit 50 pressed, well mounted diseased specimens in three installments during the semester.

References:

1. Pod rog shastra - S.M. Kumar
2. Pod rog vigyan - B.P. Singh
3. Plant diseases - R.S. Singh
4. Diseases of Crop Plants in India - G. Rangaswami
5. Vegetable Diseases - R.S. Singh
6. Diseases of fruit crops - V.K. Gupta & S.K. Sharma
7. Diseases of fruit crops - V.N. Pathak

COURSE TITLE : LIVE-STOCK PRODUCTION AND MANAGEMENT
COURSE No : AVET-221
CREDIT HOURS : 3 (2+1)
YEAR/SEMESTER : 1ST YEAR / 1ST SEMESTER

Theory :

1. Importance of Livestock in Indian Economy.
2. Important Exotic and Indian breeds of Cattle, Buffalo, Goat, Sheep and Swine.
3. Housing for different categories of Livestock.
   Objectives, Advantages, Selection of site, Different systems of housing with space requirement.
4. Care and Management of newborn calves, growing heifers, Cows at/after parturition.
5. Feeding for different categories of livestock.
   Feed and fodders for animals, Principles of feeding, Different types of ration, Feeding of calves, growing heifers and dairy cows.
6. Selection and Breeding of livestock.
   Different systems of breeding, Factors affecting fertility in livestock, Artificial Insemination, Definition, Objectives, Techniques, Advantages of A.I.
7. Milking of Cow.
   Different type of milking, Measures for clean milk production, Factors affecting milk yield and its composition, Milk Secretion, Milk Let- down.
8. Disease control measures, Management of Infectious and Contagious diseases of livestock and Preventive measures.
9. Cost of production of milk, Economical units of cattle, buffalo, sheep, goat and swine.
10. Poultry Production.
    Important Indian and foreign breeds of poultry, Different systems of housing and Breeding, Management of chick, Grower and Layer birds, Incubation and hatching, Management of incubator during incubation, Diseases of poultry, vaccination schedule.

Practical:

1. Body parts of different categories of animals.
2. Methods for judging and culling of animals.
3. Methods for identification of farm animals.
4. Computation of ratio for different categories of animals.
5. Design and layout of housing for cattle and poultry.
6. Different methods of injection and procedure.
7. Structure of poultry egg, selection and care of hatching egg.
8. Visit to livestock farms and economics of livestock production.

References:

1. A Textbook of Animal Husbandry - G.C. Banerjee.
2. Handbook of Animal Husbandry - ICAR, Krishi Anusandhan Bhawan, New Delhi.
3. Poultry Production - B. Panda and S.C. Mahapatra.
4- पशुपालन एवं पशुचिकित्सा विज्ञान – देवनारायण पाण्डेय
5. Animal Nutrition in the Tropics - S.K. Ranjhan
6. Poultry Production - R.A. Singh, Kalyani Publicsher, New Delhi
7. Handbook of Animal Husbandry - K.C. Mahanta
8- आधुनिक कुक्कुट पालन – डॉ. शतवीर सिंह, कृषि अनुसंधान भवन, पूसा, नई दिल्ली।
9. Livestock Production and Management – N.S.R. Sastry and C.K. Thomas

COURSE TITLE	**:**	**SOIL CHEMISTRY, FERTILITY AND NUTRIENT MANAGEMENT**
COURSE No	:	ASOIL-221
CREDIT HOURS	:	3 (2+1)
YEAR/SEMESTER	:	2nd YEAR / 2nd SEMESTER

Theory:

Soil as a source of plant nutrients. Essential and beneficial elements, criteria of essentiality, forms of nutrients in soil , mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Measures to overcome deficiencies and toxicities. Problem soils – acid, salt affected and calcareous soils, characteristics, nutrient availabilities. Reclamation – mechanical, chemical and biological methods. Fertilizer and insecticides and their effect on soil water and air. Irrigations water – Quality of irrigation water and its appraisal. Indian standards for water quality. Use of saline water for agriculture. Soil fertility – Different approaches for soil fertility and productivity evaluation. Methods, Soil testing – Chemical methods. critical levels of different nutrients in soil. 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 and calculation of nutrient through different fertiliers . Factors influencing nutrient use efficiency (NUE) in respect of N, P, K. Source,method and scheduling of nutrients (macro & micro) for different soils and crops grown under rainfed and irrigated conditions.

Practical:

1. Principles of analytical Instruments (Colorimetry and flame photometry.
2. Atomic absorption spectrometer) and their calibration and applications.
3. Estimation of available N, P, K, S, and Zn in soils.
4. Determination of quality parameters of irrigation water.
5. Determination of Lime requirement and gypsum requirement of problem soils.
6. Estimation of N, P and K in plants.
7. Soil Testing and Analysis: Plant, Water and Pesticides Residues by Pati Ram Atalas Book and Periodicals New Delhi.

Reference:

1. Soil Conditions and Plant Growth by MB Russel Published by English Lenguage Book Society/Longman.
2. Nature and Properties of Soils by NC Brady
3. Management of Soil Quality for Sustainable Agriculture by B Mishra Atlas Book & Periodicals, New Delhi.
4. Fundamentals of Soil Science by ISSS, New Delhi.
5. Soil Chemistry by Bear.
6. Soil Fertility and Fertilizer by Tisdale Nelson and Buston.
7. Soil Fertility and Plant Nutrition by Kanwar and Chopra.
8. Introduction to soil and Plant Growth by Donahue.

COURSE TITLE	**:**	**INTRODUCTION TO COMPUTER APPLICATIONS**
COURSE NO.	:	AST-221
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	2nd Year 2nd Semester

Theory:

Introduction to Computers, Anatomy of Computers, Input and Output Devices; Units of Memory, Hardware, Software and Classification of Computers; Personal Computers,

Types of Processors, booting of Computer, warm and cold booting, Computer Viruses, Worms and Vaccines

Operating System- Disk Operating System (DOS)and WINDOWS: Some fundamental DOS Commands, FORMAT, DIR, COPY, PATH, LABEL, VOL, MD, CD and DELTREE, Rules for naming files in DOS and Types of files.

WINDOWS: GUL, Desktop and its elements, WINDOWS Explorer, working with files and folders; setting time and date, starting and shutting down of WINDOW. Anatomy of a WINDOW, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars

Application –MSWORD: Word, processing and units of document, features of word-processing packages. Creating, Editing, Formatting and Saving a document in MSWORD

MSEXCEL: Electronic Spreadsheets, concept, packages. Creating, Editing and saving a spreadsheet with MSEXCEL; Use of in-built Statistical and other functions and writing expressions; Use of Date Analysis Tools, Correlation and Regression, t-test for two-sample and ANOVA with one-way Classification, Creating Graphs

MS Power Point: Features of Power Point Package.

MSACCESS: Concept of Database, Units of database, creating database; Principles of Programming: Flow Charts and Algorithms, illustration through examples.

Internet: World Wide Web (WWW), Concepts, Web Browsing and Electronic Mail.

Practical:

Study of Computer Components; Booting of Computer and its Shut Down

Practice of some fundamental DOS Commands, TIME, DATE, DIR, COPY, FORMAT, VOL, LABEL, PATH

Practicing WINDOWS Operating System, Use of Mouse, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars; WINDOWS Explorer, Creating Folders, COPY and PASTE functions

MSWORD: Creating a Document, Saving and Editing in MSWORD, Use of options from Tool Bars, Format Insert and Tools (Spelling & Grammar) Alignment of text in MSWORD, Creating a Table, Merging of Cells, Column and Row width

MSEXCEL: Creating a Spreadsheet. Alignment of rows, columns and cells using Format tool bar; MSEXCEL; Entering Expressions through the formula tool bar and use of in built functions, SUM, AVERAGE, STDEV; MSEXCEL: Data Analysis using inbuilt Tool Packs, Correlation & Regression, Creating Graphs and Saving with & without data.

MSACCESS: Creating Database, Structuring with different types of fields; MS Power Point: Preparation of slides on Power Point; Transforming the data of WORD, EXCEL and ACCESS to other format.

Internet browsing: Browsing Web Page and Creating of E-mail ID.

References:

1. Computer Fundamentals by B. Ram
2. Computers Today by Basandra
3. Introduction to Computers by Rajaraman
4. PC Software for Windows 98 Made Simple by R.K. Taxali
5. Computer Fundamentals by Balaguruswamy
6. रैपिडेक्स कम्प्यूटर कोर्स

COURSE TITLE	**:**	**SPICES, AROMATIC, MEDICINAL AND PLANTATION CROPS**
COURSE No	:	AHORT-221
CREDIT HOURS	:	3 (2+1)
YEAR/SEMESTER	:	2nd YEAR / 2nd SEMESTER

Theory:
Importance and cultivation technology of Spices – ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek; Aromatic crops – lemon grass, citronella, palmarose, vetiver, geranium, dawana; Plantation crops – coconut, arecanut, betelvine, cashew, cocoa, coffee, oilpalm; Medicinal plants – diascoria, rauvolfia, opium, ocimum, perwinkle, aloe, guggul, belladonna, nuxvomica, *Solanum khasiamum* , aonla, senna, plantago, stevia,coleus and Acorus.

Practical: Botanical description and identification of aromatic plants; Identification of varieties in spices and plantation crops; Identification of medicinal plants; Propagation techniques in aromatic and spice crops; Selection of mother palm, and seed nuts in coconut and oil palm; Study of 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 and black pepper); Training methods in betelvine; Rejuvenation practices in cashewnut; Products – byproducts of spices and plantation crops; Procedures for oleoresin extraction; Visit to local commercial plantations. Aromatic & medicinal plant nurseries and seed spices field.

Reference:

1. "Masalo ki Kheti" – Dr.R.K.Sharma, Dr.D.S.Bhati and Dr.B.N.Bhatta, *I.C.A.R., New Delhi.*
2. "Sagandhiya Phaudho Ki Kheti" – Virendra Chandra, *I.C.A.R., New Delhi.*
3. "Spices and Condiments –" – Purthi,J.S. 2006, National Book Trust India *A.S.Green Park, New Delhi.*
4. "Medicinal and Aromatic Crops", *Aaviskar Publishers Distributors, Jaipur, Rajadthan.*
5. "Text Book of Plantation Crops, Pillai,K.h. (1984). *Vikram Publication New Delhi.*
6. "Spices and Plantation Crops" Shanmugavelu, K.G. and Madhaorao, *Sterling Road, Nungambakkam.*

COURSE TITLE : PRACTICAL CROP PRODUCTION - II
COURSE No : AGRO-222
CREDIT HOURS : 1 (0+1)
YEAR/SEMESTER : 2nd YEAR / 2nd SEMESTERPractical:
Crop planning, raising field crops in multiple cropping systems: Field preparation, seed treatment, nursery raising, sowing, nutrient management, water management, weed management and management of insect-pests and diseases of crops harvesting, threshing, drying, winnowing, storage and marketing of produce. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students.

References:

1. Bharat ki Fasle – Chhidda Singh and Om Prakash.
2. Bharat ki Pramukh Fasle – Kalicharan Sharma.
3. Kharif and Rabi ki Fasle – Om Prakash.
4. Sasya Vigyan – Jagannath Singh.
5. Hand Book of Agriculture: ICAR.
6. Scientific crop production: C. Thakur.
7. Field Crops: Y.M. Iyer.
8. Cereal Crops: W.H. Leonard and J.H. Martin.