# **FACULTY OF AGRICULTURAL SCIENCES**

# ORDINANCE

# **B.Sc. (Hons.) Agriculture** BATCH: 2016-17 & 2017-18



## SGT UNIVERSITY SHREE GURU GOBIND SINGH TRICENTENARY UNIVERSITY GURUGRAM, Delhi-NCR

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Faculty of Agricultural Sciences SGT University (Gurgaon Haryana)

# 2016-17-42017-18

### Principles of Agricultural Meteorology 1<sup>st</sup> year/1<sup>st</sup> semester Course credits 2(1+1) Paper code 17010101

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

### Unit –1

Definition and importance of agricultural meteorology, meaning and scope and relevance of agricultural meteorology atmosphere- its composition, extent and structure, atmospheric pressure, daily and seasonal variation of wind speed and direction, cyclones, anticyclones and air masses

Unit -2

Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave and thermal radiation ,net radiation, albedo, atmospheric temperature, daily and seasonal variations of temperature, heat balance of earth and global warming Unit -3

Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, snow, rain and hail, precipitation, cloud formation and movement, evaporation and evapotranspiration, agriculture and weather relations, Introduction to monsoon Unit -4

Impact of climate on crop production, livestock, agro-climatic requirements of major crops of Haryana (rice, wheat, pearl millet, sorghum, mustard and cotton) Unit -5

Crop microclimate and its modification, Basics of medium and long range weather forecasting, agroclimatic zones of Haryana and India, concept of climate change and air pollution, smog; introduction to remote sensing and GIS

### Practical:

Agro-meteorological observatory – its site selection, installation and exposure to instruments, weather data recording; measurement of total solar radiation, short wave and long wave radiation, albedo and sunshine duration; Maximum and minimum ambient temperature, soil temperature, dew point temperature; Determination of vapor pressure, relative humidity, atmospheric pressure, wind speed and wind direction; Measurement of rain, open pan evaporation and evapo-transpiration, Processing, tabulation and presentation of weather data.

### Suggested Readings:

Khadekar, S.R. 2001. Meteorology. Agromet publishers, Nagpur

Prasada Rao, G.S.L.H.V. 2005. Agricultural Meteorology. Second Edition. Keral Agricultural University, Thrissur.

Varshneya, M.C. and Balakrishna Pillai, B. 2003. Textbook of Agricultural Meteorology. ICAR, New Delhi.

H .S. Mavi 1994. Introduction of Agrometeorology. 2nd EditionOxford IBH

Faculty of Agricultural Sciences SGT University (Gurgaon Haryana)

## Introductory Agriculture 1<sup>st</sup> year/1<sup>st</sup> semester

Course credits 1(1+0) Paper code 17010102

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

### Unit 1

Definition and importance of agriculture, meaning and scope of agriculture, plant growth and development- concept and differences, general growth curves, elements affecting crop production, classification of crops

Unit -2

Art, science and business of crop production; agricultural heritage, chronological agricultural technology development in India, ancient Indian agriculture in civilization era, conversion of man from food gatherer to food producer, development of agriculture, chronological agricultural development in India.

### Unit -3

Factors affecting crop production, Indian agriculture balance sheet, contrasting trends in agriculture growth, aspect of food chain and energy flow, soil physiographic and diversity, aquaculture, water resources of Haryana and India.

### Unit -4

Environment, ecology and ecosystem, economic ecology, classification of agriculture on the basis of irrigation (Rainfall), cropping and farming system, need and importance of valve addition in agriculture, requirement of new technology

#### Unit-5

Women in agriculture, multifaceted roles and tasks, work stress factors, nutritional and rural standards, drudgery reduction for farm women, women friendly technology, empowerment of women, role and impact of extension and training of farm women

10. Suggested Readings:

| 0. 0466 | csteu reduings.  |
|---------|--|
| 1       | Ahmed, S. 2004. Gender Issues in Agricultural and Rural Livelihoods-Vol. I M.S.  |
|         | Swaminathan Research Foundation, Chennai and Kerala Agricultural University,     |
|         | Thrissur.  |
| 2       | Commonwealth Secretariat.1996. Women and Natural Resource Management: A          |
|         | Manual for the Asian Region. Gender and Youth Affairs Division, London.          |
| . 3     | FAO [Food and Agriculture Organization of the United Nations]. 2001. Field Level |
|         | Handbook, SEAGA Socio-Economic and Gender Analysis Programme. FAO,               |
|         | Rome (Available:http://www.fao.org/sd/seaga/downloads/En/fieldEn.pdf).           |
| 4       | Husain, M. 1996. Systematic Agricultural Geography. Rawat Publications, Jaipur   |
| 5       | Noor Mohammed.1992. Origin, diffusion and development of agriculture. In: Noor   |
| 2. 4945 | Mohammed (ed.), New Dimensions in Agricultural Geography: Vol.1.Historical       |
|         | Dimensions of Agriculture. Concept Publishing Co., New Delhi. Pp29-75.           |
|         |  |

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### 1<sup>st</sup> Semester/ 1<sup>st</sup> Year

### Fundamentals of Computer Science

### Course Credits: 2(1+1) Paper Code: 17010103

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Introduction, about computer, computer application areas, Generations of Computer (I-V), Block Diagram of a Computer.

Functions of the Different Units; Input unit, Output unit, Memory unit, CPU (ALU+CU)

Unit 2

Input & Output Devices, Input Devices: Keyboard, Point and draw devices mouse, joystick, track ball, light pen, Data Scanning devices, image scanner, OCR, OMR, MICR, Bar code reader, card reader) Voice Recognition Device Digitizers Output Devices: Monitor Printer laser printer, dotmatrix printer, ink jet printer Projecte, pendrive

### Unit 3

Memories [Memory hierarchy] Registers ; [Types of Registers] Cache Memory. Primary Memory RAM,DRAM and SRAM ROMROM BIOS/ Firmware Types of ROM Secondary Memories Hard disk Structure of a hard disk, how data is stored in a hard disk, , sectors, clusters, cylinders formatting of hard disk (low level formatting and high level formatting) Floopy [data storage mechanism]CD [data storage mechanism, Software, System Software

### Unit 4

a. Operating System Functions of O/S. Types of O/S. Program Language Translator,s Assembler, Compiler Interpreter Utility Programs Communication Software Performance Monitoring Software, Application Software,, Languages Machine language, Assembly language ,High level language

Practical:

MS Office

i) MIcrosoft Word

ii) Microsoft Excel

iii) Microsoft Powerpoint

### 11. Suggested Readings:

| 1 | Sharma K.V.S. 2001. Statistics made simple: Do it yourself on PC. Prentice Hall of India.  |
|---|--|
| 2 | Capron.H.L. 1996. Computers – Tools for an information age – Fourth Edition. The Benjamin / Cummings Publishing Company, Inc., New York. |
| 3 | Peter Nortons. 2001. Introduction to Computers – Fourth Edition. Tata Mc Graw<br>Hill Publishing Co. Ltd., New Delhi.                    |
| 4 | P.K. Sinha 2009. Computer Fundamentals-Third Edition. BPB publication  |

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### 1<sup>st</sup> Semester/ 1<sup>st</sup> Year Communication Skills and Personality Development Course Credits: 2(1+1) Paper Code: 17010104

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

### Unit-1

**Introduction:** Definition of Communication, Types of Communication, Importance & Principles of Communication, Barriers in Communication, Technical communication, levels & language as a tool of communication, Flow of communication.

### Unit-2

**Review of Grammar:** Types of Sentences, Parts of Speech in brief, Transformation and Synthesis of Sentences, Verb and Tense Forms, Voice, Direct & Indirect speech, Phonetics.

### Unit-3

**Vocabulary:** Idioms and Phrases, Common Errors, Use of Dictionary for Learning to pronounce words, Word Formation by adding Prefixes & Suffixes, Homophones & homonyms.

### Unit-4

**Spoken English:** Audience Psychology & Presentation Skills& importance of presentations, Using Body language, posture, gesture & Non-verbal Communication, Interview techniques, Discussion & Debate, Telephonic Conversation, Attitude & kinds & importance of attitude

### Unit- 5

**Writing Skills:** Précis Writing, Letter Writing, Curriculum Vitae Writing, Listening, Reading, Comprehension (1- Man & Nature by J. Bronowski, 2- Science and survival by Barry Commoner, 3- The Mother of the Sciences. By A. J. Bahm. Exercise of prescribed short essays.), Report writing, Note Taking and Note Making, Technical report writing.

### Practical:

Syllabus as in theory part

### Suggested Readings:

| 1   | Krishnaswamy N. and Sriraman, T. 1995. Current english for colleges, macmillan India Limited, Madras |
|-----|--|
| 2   | A Dilemma: A layman looks at science raymond B. Fosdick  |
| 3   | Improve your writing, ed. V.N Arora & Laxmi Chandra, Oxford University<br>press2001, New Delhi.      |
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### 1<sup>st</sup> Semester/ 1<sup>st</sup> Year Mathematical Methods in Agriculture (For students of Biology Stream in 10+2) Course Credits: 4 (4+0) Paper Code: 17010105

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

### Unit-1

Algebra: arithmetic and geometric series; permutation and combination; binomial theorem; determinants; matrices and their properties, inverse of a matrix; solution of linear equations;

### Unit-2

Algebra- basic concept, types of vectors, multiplication of a vector by a scalar; cross and dot product of two vectors.

co- ordinate geometry- distance between two points, section-formulae; straight line, slope of a line, various forms of the equation of a line, angle between two lines, distance of a point from a line;

### Unit-3

Trigonometry: trigonometric ratios of five standard angles; allied angles, addition and subtraction formulae, sum and product formulae; t-ratios of multiple and sub -multiple angles; differential calculus: function; limit, continuity and differentiation of function; maxima and minima of function of single variable; Rolle's Theorem and mean value theorem;

### Unit-4

integral calculus- elementary integration, integration by substitution and by parts; definite integrals, evaluation of definite integrals; properties of definite integrals; area under simple curves; function of two variables, evaluation of partial derivatives; differential equations; vector

### Suggested Readings:

| S. No. | Authors/ Name of Books/Publisher                |
|--------|---|
| 1      | Algebra by D. C. Kapoor and Gurbax Singh        |
| 2      | Algebra by T. N. Nagpal and K. K. Gupta.        |
| 3      | Comprehensive Calculus by R. S. Dehiya.         |
| 4      | New Style Calculus for T. D. C. – I.            |
| 5      | New Style Co-ordinator Geometry by R. K. Sondhi |
| 6      | Trignometry by Jiwan                            |

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### 1<sup>st</sup> Semester/ 1<sup>st</sup> Year Elementary Botany (For Students of Math Stream in 10+2) Course Credits: 2(1+1) Paper Code: 17010106

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

### UNIT-1

Morphological features (Root, Stem, Leaf, Flower, Fruit and Seed) of Angiosperms (Flowering Plants); Elementary Knowledge of Simple & Special types of inflorescence Pollination – Types and agents

Fertilization, Embryo formation Seed and Fruit development

### UNIT-2

Anatomy- Types of tissues, their structure and functions; internal structure of stem, root and leaf (Dicot and Monocot)

### UNIT-3

Basic concept of classification, systematics and their utility; Polynomial and Binomial nomenclature Plant water relation (water potential, osmosis, plasmolysis, imbibition) Absorption and transportation of water in plants (Post prossure & transpiration pull)

Absorption and transportation of water in plants (Root pressure & transpiration pull) Transpiration

### UNIT-4

### Basic concept of plant growth & development

Basic concept of respiration (Glycolysis, Fermentation, Aerobic Respiration, TCA cycle, Electron transport system)

Photosynthesis

### Practical:

To learn: a) use of microscope b) Principles of fixation & Staining.

Morphological study of plants parts (vegetative & reproductive) and their microscopic examination (pollen grains, ovules, root, stem & leaf slides)

Demonstration of diffusion, imbibition, osmosis, ascent of Sap

Extraction of plants pigments & their isolation by paper chromatography

Plant growth measurement

### Suggested Readings:

| 1 | A.C. Dutta: Text Book of Botany (Latest Ed.). Oxford University Press- India, 2000. |
|---|---|
| 2 | Vidyarthi: Text Book of Botany Part – I. S. Chand and Company, New Delhi, 2002.     |
| 3 | Widge and Bhatia: Introduction of Botany. Truman Publishers, Jalandhar, 2010.       |
| 4 | Bhojwani, S.S. and Bhatnagar, S.P., 1992, The Embryology of Angiosperms, Vikas      |
|   | Publishing House, New Delhi.  |

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### 1<sup>st</sup> Semester/ 1<sup>st</sup> Year

# (For Students of Math Stream in 10+2) Course Credits: 2(1+1) Paper Code: 17010107

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

### Theory:

### Unit-1

Zoology and its branches, their scope and importance; Introduction to taxonomy, classification of animal kingdom at phylum level with characters of all phyla

### Unit-2

Animal life: structure and functions of various tissues of animal; Human body systems (Digestive and reproductive Systems)

### Unit-3

Important Communicable diseases (Leprosy, Measles, Chickenpox, Smallpox); Important inherited and acquired sex linked diseases (their symptoms and precautions). Basic concepts of cancer

#### Unit-4

Type of immunity (disorders and production of immunity) and human population growth (causes of increase in human population and factors controlling population growth)

### Practical:

Identification and general characters of animals of various phyla; Study of structures of mammalian tissues with the help of permanent slides and samples; Study of structure and functions of digestive and reproductive systems of cockroach

| 1  | Physiology of Farm Animals by Marshall   |  |
|----|--|--|
| 2  | Physiology of Domestic Animals by H. H. Duke.  |  |
| 3  | Anatomy of Domestic Animals by Blsson.   |  |
| 4  | General Zoology by Sterer.   |  |
| 5  | Text Book of Zoology by Vidyarthi.   |  |
| 6. | Biology text book for 11 <sup>th</sup> and 12 <sup>th</sup> Students – NCERT Publication |  |

## 1<sup>st</sup> Semester/1<sup>st</sup> year Fundamentals of Rural Sociology & Educational Psychology

Course Credit: 2(2+0)

Paper Code: 17010108

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Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with

10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks. Theory:

#### Unit-1

Sociology and rural sociology: meaning, definition scope and importance of rural sociology, Role of rural sociology in agriculture extension; differences and relationship between rural and urban communities; key concepts : dominant caste, factions, sanskritisation and village unity.

### Unit-2

Social Stratification: Meaning, definition, forms, characteristics. Differences between class and caste system; social institutions in rural society; Family, Kinship, Marriage and religion, meaning , definition, functions and their role in agriculture extension; social control: meaning , definition , need and means; social change: meaning , definition , nature, factors of social change.

Unit-3

Peasantry; definition and types of peasantry, land tenure system and land reform, agrarian unrest and its causes. Leadership: meaning, definition, classification and role of a leader in agricultural extension, village co-operatives and their role in agricultural `extension.

#### Unit-4

Rural development; History, government policies and programmes of rural development and their impact; Panchayati Raj institutions and their role in rural development. Changing rural society, factors of change

Suggested Readings:

| 1 | Desai A. R,(2003)Rural Sociology in India. Popular Parkasan, Bombay.  |
|---|---|
| 2 | Samanta. R. K. and Arora, S. K.(eds.) (1997). An Introduction to Sociology. Kitab Mahal S.D.Pvt. Ltd., Allahabad. |
| 3 | Doshi, S. L.and P. C. Jain eds. (2016) Rural Sociology. Rawat Publications, Jaipur.                               |
| 4 | Mondal , S. AndRay G. L. (2007) A Text Book of Rural Development. Kalyami Publishers,<br>Chennai .                |

### 1<sup>st</sup> Semester/ 1<sup>st</sup> Year

### Introduction to Soil Science

Course Credits: 3 (2+1) Paper Code: 17010109

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

### Unit-1

Soil: Pedological and edaphological concepts, Origin of the earth, Earth's crust; composition of soil; Soil forming rocks and minerals, Soil formation, factors affecting soil formation, soil forming processes; soil colour, Development, of Soil profile.

Unit-2 Taxonomic classification of soils: soils of Haryana and India; Soil physical properties, Soil texture, Particle Faculty of Agricultural Sciences SGT University (Gurgaon Haryana) size distribution system, Soil structure classification and its significance, Soil aggregates, Soil consistency and its types, Bulk density and particle density of soils & porosity, their significance in agriculture.

### Unit-3

Soil crusting; soil compaction; Soil water, forms, hygroscopic, capillary and gravitational, soil moisture constants-hygroscopic coefficient, wilting point, field capacity, moisture equivalent, maximum water holding capacity, soil temperature and thermal properties; soil air and gaseous exchange; influence of soil temperature and air on plant growth.

### Unit-4

Soil colloids, Properties, nature, types and significance; Layer silicate clays- genesis, charges; adsorption of ions, ion exchange and its significance; soil reaction; soil organic matter- composition, decomposition, mineralization and humus and its fractionation; soil organisms and their significance.

### Practical:

Identification of rocks and minerals; study and description of a soil profile; determination of bulk density and particle density; soil strength; soil moisture determination; determination of field capacity, infiltration rate, water holding capacity; mechanical analysis of soil; soil temperature; collection and processing of soil samples; determination of organic carbon, pH and electrical conductivity.

### Suggested Readings:

| 1 | Biswas, T.D. and Mukherjee, S.K. 2001. Text Book of Soil Science. Tata McGraw Hill Publishing Co., New Delhi |
|---|--|
| 2 | Brady, N.C. 1990. Nature and Properties of Soils. 10th Edn, Macmillian Publishing Co. Inc., New York         |
| 3 | Das.D.K, 1997. Introductory Soil Science. Kalyani Publishers, New Delhi.                                     |
| 4 | Foth, H.D. and Turk, L. M. 1972. Fundamental of Soil Science. 5th Edn. Wiley Eastern Pvt. Ltd., New Delhi    |
| 5 | Gupta, P.K. 2007. Soil, Plant, Water and Fertilizer Analysis. Published by AGROBIOS (India), Jodpur          |
| 6 | ISSS, 2002. Fundamentals of Soil Science. Published by Indian Society of Soil Science, IARI, New Delhi       |
| 7 | Jaiswal, P.C. 2006. Soil, Plant and Water Analysis. 2nd Edn. Kalyani Publishers, ludhiyana                   |

1<sup>st</sup> Semester/ 1<sup>st</sup> Year Insect Morphology and Systematics Course Credits: 4 (3+1)

### Paper Code: 17010110

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 40 questions, each of one (01) marks. Part B will have ten (10) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt eight out of ten questions from Part B. Each question in this Part shall carry ten (10) marks.

Theory:

### culty of Anricultural Sciences

History of Indian entomology and the contribution of Pioneer Global entomologists. Role of important

entomological institutes in India. Factors responsible for insect abundance on earth, importance and characters of phylum arthropoda and its classes with the differences and relationships among them with special reference to class hexapoda (Insecta).

### Unit-2

Insect Morphology: Insect integument its structure and functions, moulting process, insect body regions, cockroach/grasshopper head sclerites and sutures (Frontal view), types and modifications of insect antennae, mouthparts; thorax - types of wings and legs with their modifications, wing venation, abdominal segments and its appendages, metamorphosis, diapause and inactive stages in insects, Structure and functions of digestive, circulatory, respiratory, nervous and reproductive systems in insects (cockroach/grasshopper), reproduction and multiplication in various insect species.

### Unit-3

Systematics – Definitions of taxonomy, binomial nomenclature, species, biotype, genus, family, order; insect hierarchy and classification up to orders and important families of agricultural importance: along with their distinguishing characters; order: Orthoptera – family acriididae, Tettigonidae; orderdictyoptera: Family-Mantidal and Blattidal

Systematics: taxonomy - importance, history and development and binomial nomenclature; definitions of biotype, sub-species, species, genus, family and order; classification of class insecta upto orders; important families of various orders: Thysanura, Diplura,Protura, Collembola, Ephimeroptera, Odonata, Plecoptera, Grylloblattodea, Phasmida, Dermeotra, Embioptera, Orthoptera (Families: Acrididae, Tettigoniidae, Gryllidae, Gryllotalpidae, Schizodactylidae); Dictyoptera (Blattidae and Mantidae,); Z or a p t e r a, P s o c o p t e r a, M a l l o p h a g a, S i p h u n c u l a t a, Isoptera (F:Termitidae); Thysanoptera (F:Thripidae); Hemiptera (Sub Order Homoptera and Heteroptera)-(Families: Delphacidae, Aphididae, Coccidae, Aleurodidae, Pseudococcidae, Lophopidae, Lacciferidae, Tingidae, Reduviidae, Cimicidae, Anthocoridae, Miridae, Lygidae, Pyrrhocoridae, Coreidae, Belastomatidae); Neuroptera (Chrysopidae); Lepidoptera (F: Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Pieridae, Danaidae, Papilionidae, Epipyropidae, Lycinidae, Pieridae, Poplionidae, Hesperidae);

Unit-4

Coleoptera (F: Coccinellidae, Chrysomelidae, Cerambycidae, Bruchidae, Scarabaeidae, Carabidae, Dermestidae, Tenebrionidae, A n o b i i d a e , Meloidae, Bostrychidae, Lampyridae, Curculionidae,); Strepsitera, Mecoptera, Siphonaptera,Trichoptera, Hymenoptera (F:Tenthridinidae, Formicidae, Vespidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae, Encyrtidae, Aphelinidae, Chalcididae, Xylopidae, megachilidae); Diptera (Cecidomyidae, Tachinidae, Agromyzidae, Tephritidae, Syrphidae, Muscidae, Culicidae, Tabanidae, Phoridae, Drosophilidae, Anthomyiidae, Glossinidae, Hippobocidae, Asilidae. Psilidae).

### Practical:

Methods of collection and preservation of insects including immature stages; external features of grasshopper/cockroach; types of insect antennae, mouthparts and legs; wing venation, types of wings and wing coupling apparatus; types of insect larvae and pupae; dissection of digestive system in insects; dissection of male and female reproductive systems in insects; study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their agriculturally important families.

**Note:** Students should submit sufficient insect specimens representing different orders and families before the practical examination.

Suggested Readings:

| 145505101 | readings.   |
|-----------|---|
| 1         | Chapman, R. F. 1981. The Insects: Structure and Function. Edward Arnold Publishing  |
|           | Limited, London. 919 p.   |
| 2         | Mani, M. 9. 1968. General Entomology. Oxford and IBH Publishing Company, New Delhi. |
|           | 912 p. 1/0  |
|           | 26  |
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|           | SGT University<br>(Gurdaon Hayana)  |

| 3 | Richards, O.W. and Davies, R. G. 1977. Imm's General Text Book of Entomology, Vol.1and2, Chapman and Hill Publication, London, 1345p. |
|---|---|
| 4 | Srivastava, P. D. and Singh, R. P. 1997. An Introduction to Entomology, Concept<br>Publishing Company, New Delhi, 269p                |

### 1<sup>st</sup> Semester/ 1<sup>st</sup> Year

### Introduction to Statistical Methods

Course Credits: 2 (2+0) Paper Code: 17010111

**Note:** The question paper will have two parts- Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### UNIT-1

Definition, uses and limitations of Statistics, concept of population and sample, concept of data typesnominal, ordinal, discrete and continuous data. Graphical presentation of data. Frequency distribution, frequency curve, frequency polygon and ogives. Measures of central tendency (Arithmetic Mean, Median and Mode), Measures of dispersion (Range, Mean deviation, Standard deviation and Coefficient of variation). Measures of skewness and kurtosis.

### UNIT-2

Concept of bivariate data, scatter diagram. Simple, Partial and multiple correlations, spearman rank correlation. Simple linear regression analysis.

### UNIT-3

Basic concept of probability. Normal distribution and its properties. Concept of parameter, statistics and statistical hypothesis, null and alternative hypothesis, level of significance, type-I and type-II errors, degrees of freedom. Tests for single mean and comparison of two means. F-test and applications, Chi-square test in 2X2 contingency table, Yates correction for continuity.

### UNIT-4

Principle of experimental design, layout, model and analysis of completely randomized design (CRD), randomized block design (RBD) and Latin square design (LSD).

### SUGGESTED READINGS:

| 1.       | Gupta, S.C. and Kapoor , V.K. (1997): Fundamentals of Mathematical Statistics.<br>Sultan Chand and Sons Publisher, New Delhi. |
|----------|---|
| 2.       | Chakravorthi, S.R. and Giri, N. (2002): Basic Statistics. South Asian Publishers, New Delhi-110014.                           |
| 3.       | Rangaswamy, R. (2002): A text book of Agricultural Statistics. John Wiley and Sons.   |
| 4.       | Balakrishnan, N. (2002): Statistical Methods and Practice. Prentice Hall of India.  |
| 5.       | .Ferrold, H. Zar. (2005): Biostatistical Analysis: Fourth Edition, Pearson Education,<br>India                                |
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|          | Gurdaon Harvana)  |

### 2<sup>nd</sup> Semester/ 1<sup>st</sup> Year Principles of Agricultural Economics Course Credits: 2(1+1) Paper Code: 17010201

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks. Theory:

### Unit-1

General economics and agricultural economics: definition and meaning subject matter division, importance and relationship with other sciences; law of diminishing marginal utility: meaning, definition, assumptions, importance and limitations,

Unit-2

Consumer's surplus: meaning, definition and importance; demand: meaning, definition, kinds of demand, demand schedule, demand curve, law of demand, expansion and contraction v/s increase and decrease in demand.

### Unit-3

Elasticity of demand: Meaning and 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.

### Unit-4

Supply: meaning and definition, law and elasticity of supply; national income: concepts, measurement; inflation: meaning, definition, kinds of inflation and effect of inflation; basic concepts of economic growth and development.

### Practical:

To study the factors affecting demand and supply and measuring their response to changes in prices, income and expenditure etc.; equilibrium: concept and price determination; expansion and contraction vs increase and decrease in demand and supply; measuring elasticity of demand through different methods; application of law of diminishing marginal utility and its limitations, concept of consumer's surplus and its application; different concepts of national income, their relationship and measurement.

#### Suggested Readings:

| 1 |   | Dewett, K.K. 2005. Modern Economic Theory. S. Chand, New Delhi.  | 0    |
|---|---|--|------|
| 2 |   | Dewett,K.K.,Verma. 2004 Elementary Economic Theory, S.Chand, New Delhi   |      |
| 3 |   | Jhingam, M. L. 2001. Micro Economic Theory. Konark publishers, New Delhi   |      |
| 4 |   | Kenneth, E.B.1941. Economic Analysis. Harper and Row, New York.  |      |
| 5 | i | Reddy,S., Raghuram,P., Neelakantan,T.V.,Bhavani D. I. 2004. Agricult<br>EconomicsOxford and IBH Publishers, New Delhi. | ural |

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SGT University (Gurgaon Haryana)

### Principles of Agronomy 2<sup>nd</sup> year 1<sup>st</sup> semester Course credits 3(2+1) Paper code -17010202

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

### Unit-1

Definition, history and importance of agronomy, meaning and scope of agronomy, classification of crops, (agronomic, seasonal, life span, botanical, seed size, root depth, and water requirement), national and international agricultural research institutes in India and abroad.

#### Unit-2

Characteristics of good seed, its type and multiplication, crop growth rate, yield and yield attributes factors affecting them, agronomic principal involved in crop production, tilth and tillage, its importance, objective and its requirements for major crops of Haryana

### Unit-3

Soil fertility and productivity, their importance in crop production, factors affecting soil health, management of degraded soils

### Unit-4

Cropping system, cropping pattern, farming systems, manures and fertilizers, time and method of application, nutrient content of different fertilizers, and fertilizer requirement estimation of major crops of Haryana

### Practical:

Study of primary secondary tillage implements, ploughing, puddling and soil preparation, seeding equipments, methods of sowing, study of inter cultivation implements, identification of crops (ralic kharif or both), weeds and their seeds, , seed test for purity, germination and moisture content, calculation of seed rate, preparation of seedarium, identification of simple and complax fertilizers and their nutrient composition.

### Suggested Readings:

| 1  | Balasubramaniyan, P and Palaniappan, S.P. 2001. Principles and Practices of Agronomy.<br>AgroBios (India) Ltd., Jodhpur. |
|----|--|
| 2  | Brady, N.C. and Well, R.R. 2002. The Nature and Properties of Soils (13th ed.). Pearson Education, Delhi.                |
| 3  | De, G.C.1989. Fundamentals of Agronomy. Oxford and IBH Publishing Co., New Delhi.  |
| 6  | Reddy. T.Y and Reddy, G.H.S.1995. Principles of Agronomy, Kalyani Publishers, Ludhiana.                                  |
| 9  | Khadekar, S.R. 2001. Meteorology. Agromet publishers, Nagpur   |
| 10 | Prasada Rao, G.S.L.H.V. 2005. Agricultural Meteorology. Second Edition. Keral Agricultural University, Thrissur.         |
| 11 | Varshneya, M.C. and Balakrishna Pillai, B. 2003. Textbook of Agricultural Meteorology. ICAR, New Delhi.                  |

Faculty of Agricultural Sciences SGT University (Gurgaon Harvana)

### 2<sup>nd</sup> Semester/ 1<sup>st</sup> Year

Biochemistry

Course Credits: 3(2+1) Paper Code: 17010203

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks. Theory:

### Unit-1

Introduction and Importance of biochemistry in general and imparticor to Agriculture & biotechnology, plant cell and cell ion constituents (biomolecules) chemistry of biomolecules . Thair definition & functions. Carbohydrates: biologically important chiral carbon, stereoisomerism, optical activity, mutarofation reactions of monosaeeharides. Structure and function of oligio and polysaccharides. A brief account of some important carbohydrate metabolic. Pathways (Glycolysis, TC A cycle, HMP, Glyoxylate pathway Gluconeosenesis )Electron transport and oxidative phosphorylation.

### Unit-2

Classifiacation and functions of lipids: Saponiriable & non-saponifiable liquids. Sturcutre and propatues of common saturated, unsaturated and OH-fatty acids. Chemical properties of fatty acids Triacyclelycerols and characterization of fats (saponification, saponifiable number, lodine number, acctyl number, Acid number, Reichest Missed number ), Rancidity, waxes. Compound Lipids (Phospholipids & glycolipids) Steroids (structure and functions of cholesterols, eggosterol, oxidation of saturated fatty acids: B-oxidation Pathway

Unit-3

Introductions functions, classification and structure of L- Amminoacids, peptide bond, classifications proteins: their biological functions and structural organization of structural organization of (primary secondary, tertiary & quaternary )General and degradation reactions ,amino acids, Urea cycle, enzymes: classification characteristics and factors affecting enzymes activity: coenzymes, prosthetic group

Unit-4

Introduction, structure and functions of Nitrogen bases (Purifers & Pyrimidines) Nuclecosides, Nuclecosides, Common ribo and deoxyribio nucleotides, some important chemical and physical properties of nucleic acids, preliminary aspects of DNA replication, transcription and trasslation: photosynthesis, photorespiration: ammonia & Nitrate assimilation and symbiotic N<sub>2</sub> bisation: Plamthormones and second any metabolites their physiological roles;

### Practical:

Preparation of solutions and buffers, use of PH meter, colour reactions of carbohydrates, Amino acids, Protiens lipids and nuclic acids: sepration of sugars and amino acids by paper chromatography: lipids by TLC Demonstration of simple enzymes assay.

### Suggested Readings:

| 00  |   |
|-----|---|
| 1   | Conn, E.E and Stumpf, P.K. 1989. Outline of Biochemistry. Wiley Eastern Ltd. New Delhi. |
| 2   | Jain, J.L. 2004. Fundamentals of Biochemistry. 5th edn. Published by S.Chand and        |
| 8   | Company, New Delhi  |
| 3   | Robert M. Devlin Francis M. Witham. 1986. Plant Physiology. Published by CBS Publishers |
|     | and Distributers, New Delhi   |
| 4   | Nelson David and Cox Michael, 2009. Lehninger principles of biochemistry, 5th edn, WH   |
|     | freeman and company   |
| . 5 | Voet, D., and Voet G.J., 2012. Princiuples of biochemistry, 4th edn, Wiley publisher    |
| 6   | Buchanann B., and Gruissem W., and Jones R., 2002. Biochemistry and molecular biology   |
|     | of plants, Wiley-Blackwell publishers   |

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### 2<sup>nd</sup> Semester/ 1<sup>st</sup> Year Fundamentals of Genetics Course Credits: 3(2+1) Paper Code: 17010204

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

### Unit-1

Definition and terminology used in genetics; ultra structure of cells Mendelian inheritance, exceptions to the Mendel's laws; gene interaction; multiple allels pleiotropism, penetrance and expressivity

### Unit-2

# Law of population equilibrium quantitative & qualitative traits. Multiple factor Inheritance & Multiple alleles autoplastic inheritance and its differences from chromosomal inheritance.

Mendel's laws of inheritance and exceptions to the laws; types of gene interaction, multiple alleles, pleiotropism, penetrance and expressivity; law of population equilibrium, quantitative traits, qualitative traits and differences between them; multiple factor hypothesis; cytoplasmic inheritance, its characteristic features and difference between chromosomal and cytoplasmic inheritance.

### Unit-3

Mutation: Types and methods to induce them Linkage and its types Crossing over- type, mechanism and significance cytological proof Nucleus acids- structure functions type of DNA and RNA.

Mutation and its characteristic features; methods of inducing mutations and C / B technique; linkage, types of linkage and estimation of linkage; crossing over and factors affecting it; mechanism of crossing over and cytological proof of crossing over; DNA and it's structure, function, types, modes of replication and repair; RNA and its structure, function and types.

### Unit-4

Transcription, Tranlation, Genetic code Lac operon and fine structure of gene Chromosomal aberrationstructural and numerical.

Transcription, translation, genetic code and outline of protein synthesis; gene expression and differential gene activation; lac operon and fine structure of gene; numerical chromosomal aberrations (polyploidy) and evolution of different crop species like cotton, wheat, tobacco, triticale and brassicas; structural chromosomal aberrations.

### Practical:

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; chi-square analysis and interaction of factors; epistatic factors, supplementary factors and duplicate factors; complementary factors, additive factors and inhibitory factors; linkage – two point test cross; linkage – three point test cross; Hardy Wein Berg law of population equilibrium

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### Suggested Readings:

|   | 1 | Gupta P K 2007 Cytogenetics Rastogi Publishers, Meerut   |
|---|---|--|
|   | 2 | Lewin, B2005 Genes IX Oxford University Press, New York  |
|   | 3 | Phundan Singh 1995Elements of genetics Kalyani Publishers, Ludhiana                                      |
| 5 | 4 | Prasad, G. 1989 Introduction to Cytogenetics Kalyani Publishers, Ludhiana                                |
|   | 5 | Strickberger, M.W. 1996. Genetics (3rd edn.). Mac Millan Publishing Co., New Delhi                       |
|   | 6 | Swanson, C.P., Merz, T. and Young, J.1975 Cytogenetics Prentice Hall of India Private Limited, New Delhi |
|   | 7 | Winchester A M 1967 Genetics (3 rd edn )Oxford and IBH Publishing Co New Delhi                           |

### 2<sup>nd</sup> Semester/ 1<sup>st</sup> Year Livestock Production and Management Course Credits: 3(2+1) Paper Code: 17010205

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

### Unit-1

Importance of livestock in the national economy; present status and future prospects of various livestock development programmes in India; important breeds of livestock: cattle, buffalo, sheep, goat and swine; factors affecting reproduction in farm animals

### Unit-2

Selection and breeding of livestock for higher milk and meat production; milk secretion, milking of animals and factors affecting milk yield and its composition; feeding and management of calves, growing heifers and milch animals etc..

#### Unit-3

Housing and rearing systems for different species of livestock; diseases of animals and their management health management and animal farm waste management practices; animal farm records; cost of milk production and economics of viable units of cattle, buffalo, sheep, goat and swine

#### Unit-4

Classification of poultry and swine and their characteristics of important breeds; methods of rearing, breeding, feeding and management, incubation and hatching, brooding, vaccination and prevention of diseases, preservation of egg and meat, cost of production etc Breeds of dog and their rearing.

### Practical:

Visit to livestock farms; identification, handling and restraining of animals; selection, judging and culling of dairy animals; feeding techniques and ration formulation; disease control, housing and feeding practices; economics of livestock production; incubation, hatching, housing and management of poultry;

ean Faculty of Agricultural Sciences32 SGT University (Gurgaon Haryana) visit to nearby private animal farm and poultry farms. Recording of data of poultry farms and computation of economics

### 11. Suggested Readings:

| 1 | Banerjee, G.C. 1993. A Text Book of Animal Husbandry. Oxford Book Company, Calcutta.,                             |
|---|---|
| 2 | Dairy India Year Book 2001. A-25, Priyadarshini Vihar, DELHI.   |
| 3 | Hand book of Animal husbandry-Indian Council of Agricultural Research Publication, New Delhi, Third Edition, 2002 |

### 2<sup>nd</sup> Semester/ 1<sup>st</sup> Year Elementary Microbiology Course Credits: 3(2+1) Paper Code: 17010206

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

### Unit-1

Introduction to general microbiology:-

Microbiology: development and history, spontaneous generation and biogenesis, role of microorganismsagriculture, fermentation, disease, Application of microbiology; Germ theory, bacterial physiology & metabolism.

### Unit-2

### Classification, morphology, reproduction of microorganism:-

Classification-prokaryotes & eukaryats general characterstics bacteria, virus, alage fungi, & protozoa – distribution occurrence morphology, reproduction .Bacteriophagis – structure & properties viroids and prions.

### Unit-3

### Role of Microbes in soil and food microbiology:-

Soil microbiology: microbial halutias, microbial interactions, introduction to biogeochemical cycles - carbon, nitrogen, sulphur and phosphorus; role of microbus in composting, industry; food: microbial food spoilage preservation; microflora of rhizosphere and phyclosphere.

#### Unit-4

### Role of microbes in Agriculture:-

Beneficial microlus in agriculture: biofertilizers plant diseases & plant-microbe interactions Biodegradation, Biogas genetically modified organisms for crop improvement.

### Practical:

Demonstration on instruments and glassware used in a lasic microbiology laboratory.

Study of different components of microscope. Microscopic deservation fungi/ algae/bacteria /actinomycetes using oil immersion objective. Principle of staining: gram staining/spore staining/negative staining Basic media preparation technique:- nutrient, agar, nutrunt luvath.

Basic sterilisation technique using autoclave/ hot air over/ filtration. Enumeration of bacterial plating techniques- pour plate. streak plate for isolation & purification of media Isolation of *rhizobium* from legume modules by streak plate method. Demonstration of biofertilizer preparation for inoculation and seed inocubation with biofertilizers, Microbial isolation from air/demonstration of waste utilization/composting and biogas production/visit to biogas Production.

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### Suggested Readings:

| 1 | Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. 1998. Microbiology. Tata McGraw Hill Publishing Co., Ltd., New Delhi. |
|---|---|
| 2 | Stanier ,R.Y., Ingraham, Wheelis ,M.G. and Paintor ,P.R. 1986. The Microbiology World. Prentice Hall, New Jersey. |
| 3 | Tauro, P., Kapoor, K.K. and Yadav, K.S. 1989. An Introduction to Microbiology. Wiley Publications, New Delhi.     |
| 4 | Alexander, M. 1985. Introduction to Soil Microbiology .John Wiley and Sons , New York.                            |
| 5 | Subba Rao, N.S. 1999 .Biofertilizers in Agricultural and Agroforestry .Oxford and IBH , New Delhi.                |
| 6 | Subba Rao, N.S. 1999 .Soil microbiology 4 <sup>th</sup> ed .Oxford and IBH , New Delhi.                           |
| 7 | Bhagyaraj, D.J, and Ramaswami, G. 2007. Agricultural microbiology, PHI learning                                   |
| 8 | Sharma, P.D. 2007. Microbiology, Rastogi publishers   |

2<sup>nd</sup> Semester/ 1<sup>st</sup> Year Plant Pathogens and Principles of Plant Pathology Course Credits: 4(3+1)

Paper Code: 17010207

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 20 questions, each of two (02) marks. Part B will have ten (10) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt eight out of ten questions from Part B. Each question in this Part shall carry ten (10) marks.

Theory:

### Unit-1

introduction, definition and objectives of plant pathology; history of plant pathology; terms and concepts in plant pathology. Father of mycology ,Plant pathology Bacteriology,virology. Phythoplasmas Plant pathogens: introduction, important plant pathogenic organisms, different groups-fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viriods, algae, protozoa and phanerogamic parasites; classification of prokaryotes according to Bergey' s manual of systematic bacteriology; general characters of fungi, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction in fungi (asexual and sexual); nomenclature Introducer.

### Unit-2

Classification of fungi; key to divisions and sub-divisions; and study of importance fungal genera;

Unit-3

Survival and dispersal of plant pathogens; phenomenon of infection: pre-penetration, penetration and post penetration; pathogenesis: role of enzymes, toxins, growth regulators and polysaccharides.

### Unit-3

Defense mechanism in plants: structural and bio-chemical (pre and post infection); plant disease epidemiology; plant disease forecasting and remote sensing, general principles of plant diseases management: importance, general principles – avoidance, exclusion, protection – plant quarantine and inspection – qq) arantine rules and regulations;

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### Unit-4

Cultural methods: rouging, eradication of alternate and collateral hosts, crop rotation, manure and fertilizer management, mixed cropping, sanitation, hot weather ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage; role and mechanisms of biological control and PGPR; physical and chemical methods, methods of application of fungicides; host plant resistance, application of biotechnology in plant disease management, development of disease resistant transgenic plants through gene cloning; integrated plant disease management (IDM): concept, advantages and importance

### Practical:

Acquaintance to plant pathology laboratory and equipments; preparation of culture media for *fungi* and *bacteria*; isolation techniques, preservation of disease samples; [Identification of *Pythium, Phytophthora, Albugo; Sclerospora, Peronospora, Plasmopara* and *Bremia;*] *Mucor Rhizopus, Aspergillus, Lab Extamincute Penicillium,* [Oidium, Erysiphe, Phyllactinia, Uncinula and Podosphaera; [Puccinia (Melampsora Beach row), Uromyces, Hemiliea;(coffee melt) Sphacelotheca, Ustilago, Tolyposporium; Agaricus, Pleurotus; [Imperfect fungi Septoria, Record of rot S.lare Collectotrichum, Pyricularia; Trichoderma, Fusarium, Drechslera, Alternaria, Cercospora, Rhizoctonia and *Sclerotium*; demonstration of Koch's postulates; study of different groups of fungicides and antibiotics; preparation of fungicides: 0.1% ppm methods of application of fungicides: seed, soil and foliar; bio-assay of fungicides – poisoned food technique, inhibition zone technique and slide germination technique; bio-control of plant pathogens: dual culture technique, seed treatment; visit to quarantine station and remote sensing laboratory.

Suggested Readings

| 2 | Agrios, G.N. 2003 Plant Pathology Academy Press. New York.   |
|---|--|
| 3 | Dasgupta, M.K. 1998. Principles of Plant Pathology. Allied Publishers Pvt. Ltd.<br>Bangalore           |
| 4 | Maloy. O.C. 1993. Plant Disease Control. Principles and Practice. John Wiley and Sons.Inc.<br>New York |
| 5 | Nene,Y.L. and Thapliyal,P.N. 1998. Fungicides in Plant Disease Control. Oxford and IBH New Delhi       |
| 7 | Singh. R.S 2002. Introduction to Principles of Plant Pathology. Oxford and IBH Publishing, New Delhi   |

### 2<sup>nd</sup> Semester/ 1<sup>st</sup> Year

### Soil Fertility, Soil Chemistry and Nutrient Management

Course Credits: 3(2+1)

Paper Code: 17010208

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks. Theory:

### Unit-1

Soil fertility and productivity; essential and beneficial nutrient elements, criteria of essentiality, available forms, mechanism of nutrient transport to plants, functions and deficiency symptoms in plants, factors

Fearin Faculty of Agricultural Sciences SGT University (Gurgaon Haryana) affecting nutrients availability, remediation /amelioration of deficiencies and toxicities.

### Unit-2

Microbiological transformations of C, N and S in soils; problem soils: acid, salt affected and calcareous and their characteristics, nutrients availability and reclamation (mechanical, chemical and biological).

#### Unit-3

Irrigation water: quality of irrigation water and its appraisal, use of brackish water in agriculture; Methods, Soil testing –Chemical methods. Plant analysis –DRIS methods, critical levels in plants. Rapid tissue tests. Indicator plants. Biological method of soil fertility evaluation

### Unit-4

Introduction to manures and fertilizers; soil test based fertilizer recommendations to crops; integrated nutrient management; factors influencing nutrient use efficiency in respect of N, P, K, S and Zn fertilizers; sources, methods and scheduling of nutrients for different soils and crops grown under rain fed and irrigated conditions.

### Practical:

Principles of spectrophotometer, flame photometer and atomic absorption spectrophotometer; principles of extraction of available nutrients from soil and digestion of plant material for analysis; estimation of available N, P, K, S in soils; determination of CaCO<sub>3</sub>; determination of pH, EC, CO<sub>3</sub><sup>--</sup>, HCO<sub>3</sub><sup>--</sup>, Ca<sup>++</sup> and Mg<sup>++</sup> in irrigation water; lime and gypsum requirement of problem soils; estimation of N, P, K, Zn, Fe, Cu and Mn in plants; visit to soil testing lab.

### Suggested Readings:

| 1 | Burges, A, and Raw, F. 1967. Soil Biology. Acad. Press, New York   |
|---|--|
| 2 | Donahu, L. R., Miller, W. R. and Shickuluna, 1977. Soils. Prentice Hall of India Pvt. Ltd.,<br>New Delhi   |
| 3 | Mengel, K.J. and Kirkby, A. 1978. Principles of Plant Nutrition. International Potash<br>Institute, Switzerland                                  |
| 4 | Nyle.C. Brady 1995. The Nature and Properties of Soils. 10th Edn. Printice Hall India Pvt<br>Ltd. New Delhi                                      |
| 5 | Raymond W Miller and Roy L. Donahue. 1992. Soils and Introduction to Soils and Plant<br>Growth. 6th edn. Printice Hall India pvt. Ltd. New Delhi |
| 6 | Fundamentals of Soil Science. Published by Indian Society of Soil Science, IARI New Delhi, 2002  |

### 3<sup>rd</sup> Semester / 2<sup>nd</sup> Year Agricultural Finance and Cooperation Course Credits: 2(1+1) Paper Code: 17010301

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks. Theory:

### Unit-1

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Agricultural finance: nature and scope; time value of money: compounding and discounting; agricultural credit: meaning, definition, classification, need, micro finance; credit analysis: different parameters of 36

credit (4Rs, 5Cs and 7Ps) repayment plans for credit.

### Unit-2

History of financing agriculture in India; commercial banks: their nationalization lead bank scheme, regional rural banks, gramin banks, scale of finance; higher financing agencies-RBI, NABARD, AFC, Asian Development Bank (ADB), World Bank, Insurance and Credit Guarantee Corporation of India. Factors for private loan system.

### Unit-3

Factors and assessment of crop losses: determination of compensation: crop insurance, Fasal bima yogna and other government scheme advantages and limitations in application, estimation of crop yields.

### Unit-4

Agricultural cooperation: philosophy and principles, history of Indian cooperative movement, preindependence and post independence periods, cooperative credit structure-PACS, DCCB, SCB. Private lease system of farming

#### 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 and types of repayment loans. Govt schemes of crop insurance

Suggested Readings:

| 1 | Kahlon, A.S., Singh, Karam. Managing Agricultural Finance. Allied Publishers, New Delhi                                   |
|---|---|
| 2 | Reddy,S., Raghuram,P., Neelakantan,T.V and Bhavani D.I.2004. Agricultural Economics.Oxford and IBH Publishers, New Delhi. |
| 3 | Reddy,S., and Ram,P.R. Agricultural Finance and Management. Oxford and IBH, New Delhi.                                    |

Irrigation Water Management 3rd semester/2nd year Course credits 3(2+1) Paper code 17010302

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

Unit-1

Irrigation: definition and objectives, role of water in crop production ; water resources and irrigation development in India and Haryana

Unit-2

Soil-plant- water relationship, soil moisture constants and theories of soil water availability; methods of soil moisture estimation; low and high evapotranspiration and crop water requirement

Unit-3

Optimum irigation scheduling of irrigation; methods of irrigation: surface, sprinkler and drip irrigation; Irrigation efficiency and water use efficiency, Irrigation water quality and its management including

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consumptive use of water; water management in different crops (rice, wheat, maize, groundnut, sugarcane, pearl millet, chickpea, mustard)

### Unit-4

Agricultural drainage, prevention of water loss, water stress-drought and excess water, impact of lodging, strategies under limited water conditions

### Practical:

Determination of bulk density by field method, determination of soil moisture content by gravimetric, tensiometer, electrical resistance blocks and neutron moisture meter methods; determination of field capacity by field method; determination of permanent wilting point

measurement of irrigation water using different devices; calculations on irrigation water requirement and irrigation efficiencies (problems) determination of infiltration rate; demonstration of border method of irrigation, demonstration of furrow method of irrigation; demonstration of check basin and basin method of irrigation, acquaintance and upkeep of sprinkler and drip/trickle irrigation systems, determination of EC, pH, carbonates biocarbonates and Ca+ Mg in irrigation water (quality parameters)

Suggested Readings:

| 00 |  |
|----|--|
| 2  | Gurmel Singh, C. Venkataraman, G., Sastry,B. and Joshi, P. 1990. Manual of Soil    |
|    | and Water Conservation Practices. Oxford and IBH Publishing Co., New Delhi.        |
| 3  | Hansen, V.E., Israelsen, O.W., and Stringham, G.E. 1979. Irrigation Principles and |
|    | Practices (4th ed.). John Wiley and Sons, New York                                 |
| 4  | IARI [Indian Agricultural Research Institute]. 1977. Water Requirement and         |
|    | Irrigation Management of Crops in India, IARI Monograph No.4, Water                |
|    | Technology Centre, IARI, New-Delhi.  |
| 5  | Lenka, D. 2001. Irrigation and Drainage. Kalyani Publishers, New-Delhi.            |
| 6  | Mal, B. C.2002. Introduction to Soil and Water Conservation Engineering, Kalyani   |
| 2  | Publishers, New-Delhi.   |
| 7  | Michael, A.M and Ojha, T.P. 2005. Principles of Agricultural Engineering-Vol.II.   |
|    | Jain Brothers, New Delhi.  |
| 9  | Mishra, R.D. and Ahamed, M. 1993. Manual of Irrigation Agronomy. Oxford and        |
|    | IBH Publishing Company Pvt. Ltd.   |
| 10 | Prihar, S.S. and Sandhu, B.S. 1987. Irrigation of Field crops - Principles and     |
|    | Practices – ICAR, New-Delhi.   |
| 11 | Sankara Reddi, G.H. and Yellamanda Reddy, T2003 Efficient Use of Irrigation        |
|    | Water. Kalyani Publishing House, New Delhi.  |
| 12 | Tideman, E.M. 1996. Watershed Management: Guidelines for Indian Conditions.        |
|    | Omega Scientific Publishers, New Delhi.  |

Field Crops-I (Kharif) 3rd semester 2nd year Course credits 3(2+1) Paper code 17010303

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Unit-1

Theory:

Origin, geographical distribution, importance, soil and climatic requirement

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Unit-2

Varieties, cultural practices viz. seed and sowing , intercultural operations, fertilizer, water and weed management, plant protection ; harvesting and yield of cereals crops-rice, maize, sorghum (grain and forage), pearl millet, planting geometry

#### Unit-3

Varieties, cultural practices viz. seed and sowing, intercultural operations, fertilizer, water and weed management, plant protection, harvesting and yield of Pulse crops–pigeon pea, green gram, blackgram and urdbean, soybean

### Unit-4

Varieties, cultural practices viz. seed and sowing, intercultural operations, fertilizer, water and weed management, plant protection, harvesting and yield of fiber, fodder and oilseed crops– cotton, sorghum cowpea, napier, sesamum and castor, commercial crops: ghur Practical:

Identification of weeds kharif crops and their seeds; morphological characteristics of major crops, fertilizer requirement calculation and herbarium, study of yield contributing characters, yield calculations, harvesting and yield estimation, study of crop varieties and important agronomic experiments. visit to research farm and station.

### Suggested Readings:

| 00.0000 | touding of   |
|---------|--|
| 1       | Chatterjee, B.N. 1989. Forage Crop Production- Principles and Practices. Oxford and IBH . New Delhi.                               |
| 2       | Chidda Singh, Prem Singh and Rajbir Singh. 2003. Modern Techniques of Raising Field<br>Crops (2nd ed.). Oxford and IBH, New Delhi. |
| 3       | ICAR [Indian Council of Agricultural Research].2006. Hand Book of Agriculture. ICAR, New Delhi                                     |
| 4       | Pal, M., Deka, J., and Rai, R.K. 1996. Fundamentals of Cereal Crop Production. Tata McGraw Hill Pub., New Delhi                    |
| 5       | Prasad, R. (ed.). 1999. A Text Book of Rice Agronomy, Jain Brothers, New Delhi,  |
| 6       | Prasad, R. (ed.). 2001. Field Crop Production. ICAR, New Delhi   |
| 7       | Thomas, C. G. 2003. Forage Crop Production in the Tropics. Kalyani Publishers, Ludhiana  |

### 3<sup>rd</sup> Semester/ 2<sup>nd</sup> Year Principles of Plant Breeding Course Credits: 3(2+1) Paper Code: 17010304

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

Unit-1

Aims and objectives of plant breeding Floral biology, pollination and emasculation techniques in cereals, millets, pulses, oil seeds, fibers, plantation crops etc;; modes of reproduction, sexual, asexual, apomixis and their classification; significance in plant breeding; modes of pollination, genetic consequences, differences between self and eross pollinated crops.

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### Unit-2

Methods of breeding: introduction and acclimatization; selection, mass selection, Johannson's pure line theory, genetic basis, pure line selection; hybridization, types of hybridization; methods of handling of segregating generations, pedigree method, bulk method, back cross method and modified methods.

#### Unit-3

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.

### Unit-4

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:

Floral biology; study of megasporogenesis and microsporogenesis; fertilization and life cycle of an angiospermic plant; plant breeder's kit; emasculation and hybridization techniques and precautions to be taken; floral morphology, selfing, emasculation and crossing techniques; study of male sterility and incomapatibility in field plots e.g., rice, sorghum, maize, bajra, sugarcane, groundnut, sesamum, redgram, greengram, soybean, blackgram, chillies, brinjal, tomato; bhendi, bottle gourd, ridge gourd, cotton , jute, sunhemp.

Suggested Readings:

| Allard, R.W. 1960. Principles of Plant Breeding. John Wiley and Sons INC. USA. Toppan Co. |
|---|
| Ltd. Japan  |
| Choudhari, T.C. 1982. Introduction to Plant Breeding. Oxford and IBH Publishing Co., New  |
| Delhi   |
| Elliot. 1958. Plant Breeding and Cytogenetics. Mc Grow Hill. New York                     |
| Hayward, M.D., Bosemark, N.O and Romagosa (eds) 1993 Plant breeding- principles and       |
| prospects Chapman and Hall, London  |
| Kuckuck, H. Kobabe, G. and Wenzel, G. 1996 Fundamentals of plant breeding Narosa          |
| Publishing House  |
| Chahal, G. S., Gosal, S. S. 2002 Principles and Procedures of Plant                       |
| Breeding: Biotechnological and Conventional Approaches, Alpha science international       |
| Sharma, J.R. 1989. Principles and Practice of Plant Breeding. Tata Mc Graw - Hill         |
| Publishing Company Limited, New Delhi.  |
| Singh, B.D. 2001. Fundamentals of Genetics. Kalyani Publishers. New Delhi. Ludhiana       |
| Singh, B.D. 2003. Plant Breeding Principles and Methods. Kalyani Publishers. New Delhi/   |
| Ludhiana.   |
|   |

### 3<sup>rd</sup> Semester/ 2<sup>nd</sup> Year **Production Technology of Fruit Crops** Course Credits: 3(2+1) Paper Code: 17010305

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly

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### Theory:

### Unit-1

Horticulture: importance and status; fruit zones; classification of fruits based on their edible parts; dormancy, chilling requirement, heat units, juvenility; physiology of flowering and fruit-bud-differentiation.

### Unit-2

Parthenocarpy, C/N ratio, problems of unfruitfulness, fruit development and maturity; fruit injury protection from frost, chilling injury, cold hardiness, drought and high temperature resistance

### Unit-3

Modern propagation structures and greenhouses; Poly houses, hi-tech poly houses selection of location and site for planting an orchard, preparation of land and layout; orchard management practices, viz. training, pruning, fertilizer application, irrigation, plant protection measures, fertigation.

### Unit-4

Methods of cultivation of temperate, sub-tropical and tropical fruits, *viz.* apple, pear, peach, plum, almond, loquat, mango, citrus, grapes, guava, sapota, litchi, ber, phalsa, pomegranate, aonla, jamun, date-palm, papaya, banana and pineapple.

### Practical:

Identification and description of fruits and their cultivars; methods of plant, plant propagation with seeds, cuttings, layering and grafting; orchard layout and planting systems; demonstrations and practice of pruning and training of fruit trees; methods of irrigation and fertilizer application in fruit crops, fertigation , preparation of solution of growth regulators for propagation; application of growth regulators for propagation; application of growth regulators for improving fruit set, fruit size, quality, delaying/hastening ripening; visit to local commercial orchards.

### Suggested Books/Readings:

| 1 | Amar Singh, 1986. Fruit Physiology and Production. Kalyani Publishers, Delhi.                |
|---|--|
| 2 | Bose, T.K, Mitra, S.K. and Sanyal, D. 2002. Fruits: Tropical and Subtropical. Vol. I and II, |
|   | Nayaprakash Publications, Calcutta.  |

### 3<sup>rd</sup> Semester/ 2<sup>nd</sup> Year

### Manures, Fertilizers and Agro-Chemicals

Course Credits: 3 (2+1) Paper Code: 17010306

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks. Theory:

### Unit-1

Manures: bulky and concentrated, farm yard manure, different methods of composting, suitable plants species/plant residues for composting, vermicompost, green manure, oil cakes, sewage and sludge, biogas

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slurry, plant and animal refuges advantages and disadvantages of manures over fertilizer.

### Unit-2

Fertilizers: classifications, manufacturing processes and properties of major nitrogenous, phosphatic and potassic fertilizers their fate and reactions in the soil, secondary and micronutrient fertilizers, amendments, fertilizer control order, fertilizer storage and handling

### Unit-3

Types of agro-chemicals; major classes if insecticides, properties and uses of some important insecticides under each class; organic chemistry as preclude to agro chemicals; biofertilizers; botanical insecticides {*Neem*, neem seed kernel extract (NSKE)}, synthetic pyrethroids, Insecticides Act

### Unit-4

Herbicides: major classes, properties and uses of atrazine, glyphosate, butachor, benthiocarb; fungicides: major classes, properties and uses of common fungicides and plant growth regulators; adsorption and persistence of different agro-chemicals in soils and their impact

### Practical:

Determination of total nitrogen and phosphorus in manures/composts; vermi-composting; COD in organic wastes; NH<sub>3</sub> and nitrate NO<sub>3</sub>, water soluble phosphorus, potassium, calcium, sulphur and zinc content of fertilizers; adulteration in fertilizers; argentimetric and iodometric titrations- their use in the analysis of metasystox, malathion and pther insecticides, copper and sulphur fungicides; compactability of fertilizers with pesticides.

Suggested Readings:

| . 1 | Das, P.C. 1993. Manures and Fertilizers. Kalyani Publishers, New Delhi.   |
|-----|---|
| 2   | Gupta, P.K, 1999. Hand book of Soil, Fertilizer and Manure. Agro Botanica, Bikaner.   |
| 3   | Gupta, A.K. 2007. Methods in Environmental Analysis Water, Soil and Air. 2nd Edn.<br>Published by AGROBIOS (India) Jodpur.            |
| 4   | Singh, S.S, 1999. Soil Fertility and Nutrient Management. Kalyani Publishers, New Delhi   |
| 5   | Sreeramalu, U.S. (1979). Chemistry of Insecticides and Fungicides. Oxford and IBH publishing Co., New Delhi.                          |
| 6   | Stevens, R.W. (1977). Pesticides in the Environment Vol. Part 1. Marcel Dekker,<br>Inc. New York                                      |
| 7   | Tandon, H.L.S.1992. Fertilisers, Organic Manures, Recycleable Wastes and Biofertilisers. FDCO, New Delhi                              |
| 8   | Tisdale, S.L.,W.L. Nelson Beaton J.D and Havlin J.L (1997). Soil Fertility and Fertilisers. 5th Edn Printice Hall of India New Delhi. |
| 9   | Yawalkar, K.S., Agarwal, J.P. and Bokdi, S. 1984. Manures and Fertilisers. Agrl. Horti.Publishing House, Nagpur                       |

### 3<sup>rd</sup> Semester/ 2<sup>nd</sup> Year Principles of Seed Technology Course Credits: 3(2+1) Paper Code: 17010307

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

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### Theory:

### Unit-1

Introduction to seed production, deterioration of crop varieties; maintenance of genetic purity for seed production; seed quality; different classes of seed, seed production of field and vegetable crops; disadvantages of impure seed.

### Unit-2

Seed certification, phases of certification, procedure for seed certification, field inspection and field counts etc.; Seed Act, central seed committee, central seed certification board, state seed certification agency, central and state seed testing laboratories; Job description of seed certification officers and inspectors, offences and penalties.

### Unit-3

Seed control order: introduction to WTO; varietal identification through grow-out test and electrophoresis; seed drying; seed processing and grading plant; establishing a seed testing laboratory, seed testing procedures for quality assessment, seed treatment, importance of seed treatment, types of seed treatment, seed packing and seed storage, stages of seed storage.

### Unit-4

Factors affecting seed longevity during storage and good storage, conditions general principles of seed storage, measures for pest and disease control, temperature control, seed marketing, factors affecting seed marketing.

### Practical:

Seed sampling principles and procedures; physical purity analysis of field crops; germination analysis of field crops; moisture tests of field crops; viability test of field crops; seed health test of field crops; seed dormancy and its breaking methods; grow out tests for varietal identification; visit to seed production farms; visit to seed processing plants; visit to seed testing laboratories; planting ratios, isolation distance and rouging, etc.

#### Suggested Readings:

| 1 | Agrawal, P.K. 1994. Principles of Seed Technology, Kalyani Publishers, Ludhiana  |
|---|--|
| 2 | Agrawal, R.L. 1990. Seed Technology Kalyani Publishers, Ludhiana   |
| 3 | Agrawal, P.K. and N. Dadlani 1995. Techniques in Seed Science and Technology   |
| 4 | Neal C. Stoskopf, Dwight T. Tomes and B.R. Christie. 2006. Plant Breeding Theory and Practice. Scientific Publishers (India), Jodhpur. |
| 5 | Dahiya, B.S.; Rai, K.N. 1995 Seed Technology, Kalyani Publishers, Ludhiana   |
| 6 | Nema, N.P. 1999 Principles of Seed Certification and Testing Allied Publishers Pvt. Ltd.,<br>New Delhi.                                |

### 3<sup>rd</sup> Semester/ 2<sup>nd</sup> Year Production Technology of Vegetable Crops Course Credits: 3(2+1) Paper Code: 17010308

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven

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*questions from Part B. Each question in this Part shall carry twelve (12) marks.* Theory:

### Unit-1

Importance and scope of olericulture; role of vegetables in human nutrition; classification of vegetable crops; fundamentals of vegetable production

### Unit-2

Types of vegetable gardening; origin, area, production, agronomy; varieties, sowing time, seed rate, cultural practices, plant protection measures and harvesting of potato, tomato, brinjal, chilli, cauliflower and cabbage.

### Unit-3

Origin, area, production, agronomy; varieties, sowing time, seed rate, cultural practices, plant protection measures and harvesting of peas, cowpea, cluster bean, onion, garlic, carrot, radish and turnip.

### Unit-4

Origin, area, production, agronomy; varieties, sowing time, seed rate, cultural practices, plant protection measures and harvesting of okra, sweet potato, watermelon, muskmelon, bottle gourd, beet leaf and fenugreek.

#### Practical:

Identification of vegetable seeds, plants and varieties; planning and layout of a kitchen garden; preparation of nursery beds, seedbeds; seed treatment before sowing; raising of seasonal vegetable nursery hardening of seedlings and associated treatments; transplanting and aftercare of seedlings and aftercare; critical stages and methods of irrigation manures and fertilizers application; cultural operations and weed management in vegetable crops; visit to a commercial vegetable farm/kitchen garden Pot/terrace vgetable gardening.

Suggested Readings:

Bose, T. K. and Som, M. G. 1990. Vegetable Crops in India. Naya Prokash, Calcutta.Chadha, K. L. 2003. Handbook of Horticulture, ICAR, New Delhi.Choudhury, B.1983. Vegetables. National Book Trust, New Delhi.Das, P. C.1993. Vegetable crops in India. Kalyani PublishersGopalakrishnan, T. R. 2007. Vegetable Crops. New India Publishing Agency, New Delhi.Hazra, P. and Som, M. G. 1999. Technology for vegetable Production and Improvement. NayaProkash, CalcuttaKallo, G. Tomato. Allied Publishers Pvt. Ltd.Thamburaj, S. and Singh, N. 2005. Vegetables, Tuber Crops and Spices. ICAR, New Delhi.

### 4<sup>th</sup> Semester / 2<sup>nd</sup> Year Agricultural Marketing, Trade and Prices Course Credits: 2(1+1) Paper Code: 17010401

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven

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questions from Part B. Each question in this Part shall carry six (06) marks.

### Theory:

### Unit-1

Agricultural marketing: concepts and definition, scope and subject matter; market and marketing: meaning, definitions, dimensions and components of a market classification; market structure: conduct, performance, marketing functions, market functionaries or agencies.

### Unit-2

Producer's surplus: meaning, types of producers' surplus, marketable surplus; marketed surplus: importance, factors effecting 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.

### Unit-3

International trade: GATT, WTO, implications of AOA, market access; cooperative marketing: meaning and types.

### Unit-4

Quality control: agricultural products, AGMARK, characteristics of agricultural products; agricultural prices: meaning, role and types, need for agricultural price policy; risk in marketing: meaning and importance, types of risk in marketing; speculations and hedging.

### Practical:

Identification of marketing channels, study of Rythu Bazars/Apani Mandi, regulated markets and unregulated markets; estimation of marketed and marketable surplus and factors affecting it; price spread analysis and estimation of marketing efficiency through different methods; time series analysis: indices, forecasting etc; visit to marketing institutions: NAFED, APEDA, study of SWC, CWC and STC; analysis of information on daily prices and arrivals of selected commodities.

Suggested Readings:

| 1 | Acharya, S.S., Agarwal, N.L.1987. Agricultural Marketing in India. Oxford and IBH, New Delhi. |
|---|---|
| 2 | Acharya, S.S., Agarwal, N.L.1994. Agricultural Prices and Policy. Oxford and IBH, New Delhi.  |
| 3 | Philip, K. 2004. Principles of Marketing. Prentice Hall, New Delhi.                           |

## Field Crops- II (Rabi) 4<sup>th</sup> Semester /2<sup>nd</sup> year

Course credit 3(2+1) Paper code 17010402

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B, Each question in this Part shall carry twelve (12) marks.

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### Theory:

### Unit-1

Origin, geographical distribution, importance, production in Haryana and India, soil and climatic requirements, varieties, cultural practices viz. seed and sowing, intercultural operations, fertilizer, water and weed management, plant protection measures; harvesting and yield of wheat, barley;

### Unit-2

Origin, geographical distribution, soil and climatic requirements, varieties, cultural practices viz. seed and sowing, intercultural operations, fertilizer, water and weed management, plant protection measures; harvesting and yield and constrains of chickpea, lentil peas and French bean

### Unit-3

Origin, geographical distribution, soil and climatic requirements, varieties, cultural practices viz. seed and sowing, intercultural operations, fertilizer, water and weed management, plant protection measures; harvesting and yield and constrains of oil seed and sugar crops- rapeseed, mustard, sunflower and sugarcane

Unit-4

Origin, geographical distribution, soil and climatic requirements, varieties, cultural practices viz. seed and sowing, intercultural operations, fertilizer, water and weed management, plant protection measures; harvesting and yield and constrains of forage and other commercial crops- potato, barseem, oats, opium poppy, Lucerne, tobacco, lentil ,berseem ,oats, opium poppy and peas

### Practical:

Identification of seeds of rabi crops, Seed bed preparation and sowing of wheat and mustard ; Calculations on seed rate, Identification of weeds in wheat and other rabi crops, Application of herbicides and study of weed control experiments, morphological characteristics of wheat, barley, oats, rapeseed and mustard

Suggested Readings:

| 1 | Chatterjee, B.N. 1989. Forage Crop Production- Principles and Practices. Oxford and IBH .<br>New Delhi.                            |
|---|--|
| 2 | Chidda Singh, Prem Singh and Rajbir Singh. 2003. Modern Techniques of Raising Field<br>Crops (2nd ed.). Oxford and IBH, New Delhi. |
| 3 | ICAR [Indian Council of Agricultural Research].2006. Hand Book of Agriculture. ICAR, New Delhi                                     |
| 4 | Pal, M., Deka, J., and Rai, R.K. 1996. Fundamentals of Cereal Crop Production. Tata McGraw Hill Pub., New Delhi                    |
| 5 | Prasad, R. (ed.). 1999. A Text Book of Rice Agronomy, Jain Brothers, New Delhi,  |
| 6 | Prasad, R. (ed.). 2001. Field Crop Production. ICAR, New Delhi   |
| 7 | Thomas, C. G. 2003. Forage Crop Production in the Tropics. Kalyani Publishers, Ludhiana  |

4<sup>th</sup> Semester/ 2<sup>nd</sup> Year Weed Management Course Credits: 2(1+1) Paper Code: 17010403

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

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### Theory:

### Unit-1

Weeds: introduction, classification, propagation, allelopathic and beneficial effects, and dissemination; weed biology and ecology; crop weed association and crop weed competition

### Unit-2

Concepts of weed prevention, control and eradication; measure of weed control: physical, cultural, chemical and biological; solarisation, crop, copration integrated weed management.

### Unit-3

Herbicides: advantages and limitations of herbicides uses in India; herbicide classification, formulations, method of application; introduction to adjuvants and their uses in herbicides; introduction to selectivity of herbicides; compatibility of herbicides with other agro-chemicals.

### Unit-4

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 terrestrial, aquatic and parasitic weeds; survey of weeds in crop fields and their habitats; preparation of list of commonly available herbicides; preparation of weed herbarium; calculations on weed control efficiency and weed index; herbicide label information; computation of herbicide doses; study of herbicide application equipments and calibrations; demonstration of method of herbicide application; study of phytotoxicity symptoms of herbicides in different crops; biology of nutsedge, bermudagrass, *Echinochloa* spp., *Phalaris minor, Parthenium* and Trianthema; economics of weed control practices; visits to problem areas.

#### Suggested Books/Readings:

| 1 | V.S.Rao Principles of Weed Science .Oxford &IBH. |  |
|---|--|--|
| 2 | Gupta O.P. 2009 .Modern Weed Management.         |  |

### 4<sup>th</sup> Semester/ 2<sup>nd</sup> Year Insect Ecology and Integrated Pest Management Course Credits: 3(2+1) Paper Code: 17010404

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks. Theory:

### Unit-1

**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; concepts of balance of life in nature, biotic potential and environmental resistance and causes for outbreak of pests in agro-ecosystem; pest surveillance and pest forecasting; categories of pests.

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### Unit-2

**Integrated Pest Management (IPM):** introduction, importance, concepts and tools of IPM - host plant resistance, cultural, mechanical, physical, legislative, biological (parasites, predators and 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.

### Unit-3

Recent methods of pest control: repellents, antifeedants, hormones, attractants, gamma radiation and genetic control; scope and limitations of IPM; insecticide Act 1968: important provisions; application techniques of spray fluids; phytotoxicity of insecticides; symptoms of poisoning, first aid and antidotes.

### Unit-4

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; silk worms, honey bees and lac insects.

### 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, deterrence); 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, 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 and mass multiplication of important natural enemies; identification and management of honeybees; identification of rodents and bird pests and their damage; other beneficial insects: pollinators, weed killers and scavengers.

| 1 | Atwal, A. S and Bains, S. S. 1989. Applied Animal Ecology. Kalyani Publishers. New Delhi. 245p   |
|---|--|
| 2 | David, B.V. and Kumaraswami, T. 1996 Elements of Economic Entomology. Popular Book Depot, Madras. 536 p.   |
| 3 | Dhaliwal, G. S. and Ramesh Arora. 1998. Principles of Insect Pest Management. Kalyani<br>Publishers, New Delhi. 297 p.                                 |
| 4 | Dhaliwal, G. S. and Singh, B. 1998. Pesticides – The Ecological Impact in Developing Countries . Commonwealth Publishers, New Delhi. 256p.             |
| 5 | Metcalf, C. K. and Flint, W. P. 1970. Destructive and Useful Insects: Their Habits and Control. Tata McGraw Hill Publishing Company. New Delhi. 1074p. |
| 6 | Odum, E.P. 1996. Fundamentals of Ecology. Nataraj Publishers. Dehra-Dun. 574 p.  |
| 7 | Pedigo, L. P. 2002. Entomology and Pest Management. Fourth Edition. Prentice Hall.New Delhi. India. 742p.  |
| 8 | Srivastava, K. P. 2003. A Text Book of Applied Entomology. Vol. II. Kalyani Publishers, Ludhiana. 497p.  |

Suggested Books/Readings:

### 4<sup>th</sup> Semester/ 2<sup>nd</sup> Year

Dimensions of Agricultural Extension

Course Credits: 3(2+1) Paper Code: 17010405

Reculty of Agricultural Sciences SGT University (Gurgaon Harvana) Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

### Unit-1

Education: meaning, definition, types; formal 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: Shriniketan, Marthandam, Gurgaon experiment and Gandhian constructive programme; development programmes of post independence era, Firka development, Etawah pilot project and Nilokheri experiment.

### Unit-2

Community development programme: meaning, definition, concepts, philosophy, principles, objectives, differences between community development and extension education; national extension service; panchayat raj system: meaning of democratic-decentralization and panchayat raj, three tiers of panchayat raj system, powers, duties and non performance penalties and organizational setup.

#### Unit-3

Startup of agricultural development programmes, objectives and salient features: Intensive Agricultural District Programme (IADP), improved Varieties Programme (IVP), Institution Village Linkage Programme (IVLP), Watershed Development Programme (WDP), National Agricultural Technology Project (NATP), ), National Agricultural Innovation Project (NAIP) Agricultural Technology Management Agency (ATMA), Technology Management Information Centre (ATIC); social justice and poverty alleviation programmes: Integrated Tribal Development Agency (ITDA), Integrated Rural Development Programme (IRDP), Swarna Jayanthi Gram Swarojgar Yojana (SGSY), Prime Minister Employment Yojana (PMEY). MANREGA Self Help Groups (SHG)

### Unit-4

Trends in extension, privatization in extension; 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 and V System): salient features, shedules and monitoring system, linkages, merits and demerits, emergence of broad based extension.

### Practical:

Visits to a village and kisan mandals to study the ongoing development programmes; visits to Panchayat Raj Institutions to study the functioning of Gram Panchayat (GP) and Zila Parishad (ZP); visit and study the District Rural Development Agency (DRDA); visit to watershed development project area; visit to a village to study the Self Help Groups (SHGs) of DWCRA; visit to a voluntary organization to study the developmental activities; organizing PRA techniques in a village to identify the agricultural problems;

### 1 Dharma, O.P. and Bhatnagar, O.P 2000. Education and Communication for Development. Oxford, IBH, New Delhi 2 Desai, A.R. 2003. Rural Sociology in India. Popular Prakashan, Bombay 3 Khana, B.S. 1991. Rural Development in South Asia-India. Deep and Deep Publication, New Delhi. Khatari, G.R. 1991. Rural Development Vo. I and II. Marak Publications Pvt. Ltd., Delhi. 4 5 Mollett, S.M. 1984. Planning for Agricultural Development. Martin Press, London. aculty of Agricultural Scienc

#### . Suggested Books/Readings:

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| 6 | Mondal, S. and Ray G.L 2007. A Text book of Rural Development. Kalyani Publishers,   |
|---|--|
|   | Chennai  |
| 6 | Ray G.L (2007) Extension Communication and Management .Kalyani Publishers, Chennai   |
| 7 | Readdy. A.A. (1987). Extension Education. Sreelekshmy Press, Bapatta.  |
| 8 | Van den Ban, A.W. and Hawkins, H.S. (1988). Agricultural Extension. Longman Publishing                                     |
|   | Company, New York.   |
| 9 | Company, New York.<br>Samanta, R.B.(1991) Agricultural Extension in Changing World perspective.UDH<br>publishing,New Delhi |

4<sup>th</sup> Semester/ 2<sup>nd</sup> Year Breeding of Field Crops Course Credits: 3(2+1) Paper Code: 17010406

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

### Unit-1

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Hardy-Weinberg law; study of origin and distribution of species, wild relatives and forms - cereals (rice, wheat, maize, millets, sorghum, bajra); pulses (redgram, greengram, blackgram, soybean); oilseeds (groundnut, sesame, sunflower, castor, mustard) etc. fibers (cotton) etc.

### Unit-2

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Hardy-Weinberg law; study of origin, distribution of species, wild relatives and forms - Vegetables (tomato, ladies finger, chilli, cucumbers); flower crops (chrysanthemum, rose, galardia, gerbera and marigold); fruit crops (aonla, guava, mango, ber jamun ,custard apple, banana, papaya).

### Unit-3

Breeding procedures for development of hybrids / varieties of different crops; plant genetic resources their conservation and utilization in crop improvement; program ideotype concept in crop improvement (viz. wheat, rice, maize, sunflower, etc.); breeding for resistance to biotic and abiotic stresses, heat and drought tolerance

### Unit-4

Variability in pathogens and pests; mechanisms of resistance in plant against pathogens and pests; genetic basis of adaptability to unfavourable environments; definition and concept of biometricsassessment of variability i.e. additive, dominance and epistasis and their differentiation; genotype x environment interaction and influence on yield/performance; introduction to Intellectual Property Rights(IPR) and related issues.

### Practical:

Techniques of emasculation and hybridization; 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; variability estimation parameters; proportion 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 fields; visit to grow out test plots; visit to various research stations; visit to other institutions.

### . Suggested Readings:

| 1 | Stickbarger Genetics   |
|---|--|
| 2 | B.D.Singh 2015 Plant Breeding. Principles & Methods. Kalyani Publishers.10 th Edition. |

### Production Technology of spices, medicinal, aromatic and Plantation 4<sup>th</sup> semester/2<sup>nd</sup> year Course credits 2(2+1) Paper code 17010407

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

### Theory:

### Unit 1

Importance and scope of Spices, cultivation practices reference to botanical name, family, origin, distribution, climate, soil, varieties, sowing, manure and fertilizers, irrigation, intercultural operations, harvesting, yield and plant protection measures including physiological disorders of Ginger, turmeric pepper, cardamom, coriander, cumin, fenugreek

### Unit 2

Package of practices with reference to botanical name, family, origin, distribution, climate, soil, varieties, sowing, manure and fertilizers, irrigation, intercultural operations, harvesting, yield and plant protection measures including physiological disorders of medicinal plants diascoria, rauvolfia, opium, ocimum, periwinkle, aloe, guggal, belladonna, nux-vomica, solanum khasiamum, aonla, senna

### Unit 3

Package of practices with reference to botanical name, family, origin, distribution, climate, soil, varieties, sowing, manure and fertilizers, irrigation, intercultural operations, harvesting, yield and plant protection measures including physiological disorders of Aromatic plants- lemon grass, citronella, palmrose, vetiver, geranium, dawana

#### Unit 4

Package of practices with reference to botanical name, family, origin, distribution, climate, soil, varieties, sowing, manure and fertilizers, irrigation, intercultural operations, harvesting, yield and plant protection measures including physiological disorders of plantation crops- coconut, arecanut, betel, cashew, cocoa, coffee and oil palm.

### Practical:

Identification, botanical description of important spices, medicinal, aromatic and plantation crops, Harvesting, grading and packing of different crops

Curing and processing for prolonging the shelf life of different crops. Visit to different commercial gardens.

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#### 11. Suggested Readings:

| 1  | Chadha, K.L.2001. Hand Book of Horticulture, ICAR, New Delhi.   |
|----|---|
| 2  | CPCRI, 2003. Coffee Guide, Central Coffee Research Institute, Coffee Board, Chickamangalur, Karnataka.  |
| 3  | Kumar.N, Abdul Khader.J.B.M. Rangaswami.P. and Irulappan., 1993. Introduction to Spices<br>– Plantation Crops, Medicinal and Aromatic Plants, Rajalekshmi Pub, Nagercoil. |
| 4  | Balasimha, D and Rajagopal, V. 2004. Arecanut, CPCRI, Kasargod, Kerala.   |
| 5  | Bhaskara Rao, E.V. Nambiar. K.K.N, Nambiar.M.C and Nair. M.K. (Eds) 1979. Monograph on Plantation Crops I. Cashew ( <i>Anacardium occidentale</i> ), CPCRI, Kasargod.     |
| 6  | Peter, K.V. 2002 Plantation Crops, National Book Trust, India   |
| 7  | Kirthikar.K.R. and Basu.B.D. 1993. Indian Medicinal Plants, Vol. 1-4. Lalit Mohan   |
| 8  | Kurian, A and Sankar, M.A.2007. Medicinal Plants. New India Publishing Agency, New Delhi  |
| 9  | Nybe, E.V, Mini Raj, N and Peter, K.V.2007. Spices. New India Publishing Agency, New Delhi.   |
| 10 | Pruthi, J. S. 2001 Minor Spices and Condiments-Crop Management and Postharvest Technology, ICAR, New Delhi, India.  |

# 4<sup>th</sup> Semester/ 2<sup>nd</sup> Year Diseases of Field Crops and Their Management Course Credits: 3(2+1) Paper Code: 17010408

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

# Unit-1

Economic importance, symptoms, causes, epidemiology & disease cycle and integrated management of diseases of kharif crops viz.rice, sorghum, bajra, maize, guar

# Unit-2

Economic importance, symptoms, cause, epidemiology & disease cycle and integrated management of diseases of rabi crops viz. wheat, sugarcane, groundnut barlay

### Unit-3

Economic importance, symptoms, cause, epidemiology & disease cycle and integrated management of diseases of sesamum, sunflower, cotton, tobacco, mustard

#### Unit-4

Economic importance, symptoms, cause, epidemiology & disease cycle and integrated management of diseases of redgram, bengalgram, blackgram, greengram, soybean

#### Practical:

Study of symptoms, etiology, host-parasite relationship and specific control measures of the different crop diseases; presentation of disease samples survey and collection of diseases of rice, sorghum;

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Faculty of Agricultural Sciences SGT University diseases of wheat, bajra and maize; diseases of sugarcane, turmeric and tobacco; diseases of groundnut and sunflower; diseases of sesamum and cotton; diseases of redgram, greengram, blackgram, bengalgram and beans; field visits at appropriate time during the semester.

**Note:** Students are to submit sufficient number of pressed, well mounted diseased specimens of different crops before the practical examination.

#### . Suggested Readings:

| 1 | Singh, R.S 2001. Plant Disease Management, Oxford and IBH Publishing Co<br>N. Delhi. |
|---|--|
| 2 | Mehrotra. R. S. Plant Pathology. TATA Mechgrow Hill Pub. Co. N. Delhi.               |
| 3 | Ramakrishnan, T. S. 1971. Diseases of Millets. ICAR.                                 |
| 4 | Sharma, P. D. 2001. Plant Pathology, Rastogi Publications, Shivaji Road, Meerut.     |
| 5 | Singh, R. S. 1995. Diseases of Vegetables Crops. Oxford and IBH Publishing Co.       |

# 5<sup>th</sup> Semester/ 3<sup>rd</sup> Year

# Production Economics and Farm Management

Course Credits: 2(1+1) Paper Code: 17010501

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

#### Theory:

# Unit-1

Production economics: meaning, definition, nature and scope of agricultural production economics; basic concepts and terms; concepts of production; production function: meaning, definition, types, and laws of returns-increasing, constant and decreasing

# Unit-2

Factor-product relationship; determination of optimum input and output levels; factor- factor relationship; product- product relationship; types of enterprise relationships.

#### Unit-3

Farm management: meaning, definition, importance; economic principles applied to the organizational farm business.

# Unit-4

Types and systems of farming, farm planning and budgeting, risk factors and uncertainty.

#### Practical:

Computation of different costs and their application, different methods of computation of depreciation; analysis of net worth statement, farm inventory analysis and systems of book keeping; preparation of farm plans and budgets, types of farm records and accounts; preparation of profit and loss account statements; economic analysis of different crop and livestock enterprises.

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# 5<sup>th</sup> Semester/ 3<sup>rd</sup> Year Rain-fed Agriculture Course Credits: 2(1+1) Paper Code: 17010502

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this part shall carry six (06) marks.

### Theory:

#### Unit-1

Rainfed farming: introduction; climatic and edaphic characteristics of rainfed agriculture; distribution of low rainfall areas in the Haryana/India; problems of crop production in rainfed farming; land shaping and planting methods under low rainfall conditions.

#### Unit-2

Management strategies of rainfed crops; critical stages of life saving irrigations; major constraints and special package of practices for *kharif* and *rabi* crops under dryland conditions of Haryana.

#### Unit-3

Study of mulches and anti-transpirants; water harvesting and moisture conservation; principles of intercropping, cropping systems/intercropping in rainfed agriculture; selection of crops and varieties under rainfed farming system; contingent crop plans for aberrant weather situations

#### Unit-4

Watershed management: principles and practices; scope of agro-horticultural, agro-forestry and silvi-pasture in dryland agriculture.

#### Practical:

Rainfall analysis and interpretation, study of dry farming implements; agronomic measures of soil and moisture conservation; water conservation through different types of mulches and anti-transpirants, collection of biometric data of different crops and its interpretation.

5<sup>th</sup> Semester/ 3<sup>rd</sup> Year Organic Farming Course Credits: 2(1+1) Paper Code: 17010503

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this part shall carry six (06) marks.

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#### Theory:

# Unit-1

Organic Farming: introduction, concepts, relevance in present context; organic production requirements; biological intensive nutrient management - organic manures, vermi-composting, green manuring, recycling of organic residues, bio-fertilizers;

### Unit-2

Soil improvement and amendments; water and weed management.

# Unit-3

Integrated diseases and pest management; use of bio-control agents, bio-pesticides pheromones, trap crops, bird perches

#### Unit-4

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

# Practical:

Study of organically grown field crops through nutrient, diseases and pest management; vermicomposting; macro quality analysis, grading, packaging and post harvest management; quality of various composts made from different raw materials; green manure.

# 5<sup>th</sup> Semester/ 3<sup>rd</sup> Year Practical Crop Production-I (Kharif Crops) Course Credits: 1(0+1) Paper Code: 17010504

#### Practical:

Crop planning, raising field crops in multiple cropping systems; field preparation, seed treatment, sowing, nursery raising, 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.

5<sup>th</sup> Semester/ 3<sup>rd</sup> Year Crop and Stored Grain Pests and their Management Course Credits: 3(2+1) Paper Code: 17010505

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly

Faculty of Agricultural Sciences 55 SGT University (Gurgaon Haryana) distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

### Theory:

### Unit-1

Distribution, biology, nature and symptoms of damage and management strategies of insect and non-insect pests of rice, sorghum, maize, wheat, sugarcane, cotton, bajara pulses.

#### Unit-2

Distribution, biology, nature and symptoms of damage and management strategies of insect and non-insect pests of groundnut, castor, sunflower, mustard, brinjal, bhindi, tomato, cruciferous and cucurbitaceous vegetables, potato, chillies, turmeric, onion, garlic coriander, pepper, ginger

#### Unit-3

Distribution, biology, nature and symptoms of damage and management strategies of insect and non-insect pests of mango, citrus, grapevine, cashew, banana, pomegranate, guava, sapota, ber, apple, coconut, tobacco, coffee, tea, and ornamental plants;

#### Unit-4

Stored grain pests: coleopteran and lepidopteran pests, their biology and damage, preventive and curative methods.

# Practical:

Identification of pests and their damage symptoms on rice, sorghum, maize, wheat, sugarcane, cotton, pulse crops, solanaceous and malvaceous vegetables, cruciferous and cucurbitaceous vegetables, chillies, mango, ber, citrus, sapota, grapevine, guava and pomegranate.

| Suggested | Pondinge: |  |
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| Juggestet | neauiigs. |  |

| -00 | 0  |
|-----|--|
| 1   | Atwal, A. S. 1991. Agricultural Pests of India and South – East Asia. Kalyani Publishers, New Delhi. 529p.                     |
| 2   | David, B. V. 2001. Elements of Economic Entomology. Popular Book Depot, Madras, 536p.  |
| 3   | Ghosh, S. K. Dubey, S. L. 2003. Integrated Management of Stored Grain Pests.<br>International Book Distributing Company. 263p. |
| 4   | Nair, M. R. G. K. 1986. Insects and Mites of Crops in India. Indian Council of Agricultural Research, New Delhi. 267p.         |
| 5   | Pradhan, S. 1983. Agricultural Entomology and Pest Control. Indian Council of Agricultural Research, New Delhi. 267p.          |
| 6   | Rao, P. A., Mathur, K. C and Pasalu. L. C. 1987. Rice Storage and Insect Pest Management. B.R publishers. New Delhi. 187p.     |

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5<sup>th</sup> Semester/ 3<sup>rd</sup> Year Social and Farm Forestry Course Credits: 3(2+1) Paper Code: 17010506 Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

# Unit-1

Introduction: forests in India, forest influences, forest policy and law, gap between demand and supply of forest products; principles of general silviculture.

#### Unit-2

Social forestry: need, objectives and scope, choice of species for fuel wood, fodder, small timber and timber, their culturing, propagation, application of agro-techniques and economic benefits, management of social forestry plantations, nurseries and their practices; social forestry for watershed management.

#### Unit-3

Afforestation on different problematic sites; voluntary organizations and their role in promoting afforestation programmes; maintenance and conservation of village woodlots; energy plantations

#### Unit-4

Farm forestry: objectives and role, need for shelter belts and wind breaks, types of farm forestry; agroforestry: need, objectives, scope, principles and practices of agroforestry systems, choice of tree species, management implications; forest products, their processing and use.

#### Practical:

Identification of tree species suitable for timber, fuel wood and fodder; identification of tree species suitable for road side plantations, field bunds, wastelands and for wind breaks; identification of fast growing, multipurpose and nitrogen fixing trees suitable for agroforestry; identification of seeds of important tree species in above categories; collection, extraction and storage of tree seeds; testing of tree seeds for germination and viability; application of presowing treatments to problematic tree seeds; preparation and sowing of nursery beds; transplanting in nursery beds; field planting techniques; biomass and volume estimation in energy plantation; evaluation of different agroforestry systems during field visit; evaluation of wind breaks and shelter belts during field visit; identification of important major and minor forest products; visit to central nurseries of social forestry/forest departments; visit to social forestry plantations.

5<sup>th</sup> Semester/ 3<sup>rd</sup> Year Principles of Plant Biotechnology Course Credits: 3(2+1) Paper Code: 17010507

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven

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questions from Part B. Each question in this Part shall carry twelve (12) marks.

# Theory:

# Unit-1

Concepts of plant biotechnology: history of plant tissue culture and plant genetic engineering; scope and importance in crop improvement: totipotency and morphogenesis, nutritional requirements of *in-vitro* cultures; techniques of *in-vitro* cultures, micro-propagation, anther culture, pollen culture, ovule culture, embryo culture, test tube fertilization, endosperm culture, factors affecting *in-vitro* culture; applications and achievements.

### Unit-2

Somaclonal variation, types, reasons: somatic embryogenesis and synthetic seed production technology; protoplast isolation, culture, manipulation and fusion; products of somatic hybrids and cybrids, applications in crop improvement.

#### Unit-3

Genetic engineering; restriction enzymes; vectors for gene transfer, gene cloning, direct and indirect method of gene transfer, transgenic plants and their applications

### Unit-4

PCR, blotting techniques (southern, northern, and eastern); DNA probes: DNA finger printing using, DNA markers – RAPD, RFLP, AFLP, SSR, SNP and mapping QTLs, marker assisted selection, and its application in crop improvement, future prospects.

#### Practical:

Requirements for plant tissue culture laboratory; techniques in plant tissue culture- media components and preparations; sterilization techniques and inoculation of various explants; aseptic manipulation of various explants; callus induction and plant regeneration; micro propagation of important crops; anther, embryo and endosperm culture; hardening / acclimatization of regenerated plants; somatic embryogenesis and synthetic seed production; isolation of protoplast; demonstration of culturing of protoplast; demonstration of isolation of culturing of protoplast; demonstration and confirmation of genetic transformation (GUS assay/antibiotic resistance techniques); demonstration of gel-electrophoresis techniques.

# 5<sup>th</sup> Semester/ 3<sup>rd</sup> Year

**Post-Harvest Management of Fruits and Vegetables** 

Course Credits: 2(1+1) Paper Code: 17010508

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

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Importance and scope of post-harvest technology of horticultural crops; post-harvest classification of fruits and vegetables; maturity indices; changes during maturity and ripening

## Unit-2

Harvesting and post-harvest operations viz. curing, pre-cooling, sorting, grading, trimming, bunching, washing, drying, waxing, packaging and storage of fruits.

#### Unit-3

Harvesting and post-harvest operations viz. curing, pre-cooling, sorting, grading, trimming, bunching, washing, drying, waxing, packaging and storage of vegetables.

#### Unit-4

Cold chain storage systems; causes of post -harvest losses and their control measures; principles and methods of preservation of fruits and vegetables

### Practical:

Practice in judging maturity of various fruits and vegetables; determination of PLW, TSS, sugars, acidity and ascorbic acid in fruits and vegetables; types and methods of packaging; methods of prolonging storage life; effect of ethylene on ripening of banana/mango; identification of equipments and machinery used for preservation of fruits and vegetables; preparation of jam, jelly, marmalades, juices, squashes, chutneys, pickles and ketchup; visit to local processing units

# 5<sup>th</sup> Semester/ 3<sup>rd</sup> Year

# Protected Cultivation and Post-Harvest Technology

Course Credits: 2(1+1) Paper Code: 17010509

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

#### Theory:

#### Unit-1

Green house technology: introduction, types of green houses; plant response to green house 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; irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, greenhouse drying.

#### Unit-2

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.

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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 and castor shellers ; drying, grain drying, types of drying, types of dryers; storage, grain storage, types of storage structures.

### Unit-4

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, principles, types of evaporators, quality standards: FAQ, ASTA, FPO, FDA.

#### Practical:

Study of different types of green houses 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 green houses; 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 castor shellers; study of improved grain storage structure; study of dryers; study of cleaners and graders.; visit to post harvest technology unit.

# 5<sup>th</sup> Semester/ 3<sup>rd</sup> Year Fundamentals of Soil & Water Conservation Engineering

Course Credits: 3(2+1) Paper Code: 17010510

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

Unit-1

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

Unit-2

Leveling: leveling equipment, terminology, methods of calculation of reduced levels, types of leveling, contouring

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Irrigation: classification of projects, flow irrigation and lift irrigation; water lifting devices; pumps: capacity, power calculations; irrigation water measurement: weirs, flumes and orifices.

### Unit-4

Water conveyance systems: open channel and underground pipeline; irrigation methods: border, basin, furrow, drip and sprinkler irrigation systems; soil and water conservation: soil erosion, types and introduction to agronomic and engineering control measures.

#### Practical:

Acquaintance with chain survey equipment, ranging and measurement of offsets, chain triangulation, cross staff survey; plotting of chain triangulation; plotting of cross staff survey; leveling equipment, dumpy level, leveling staff, temporary adjustment and staff reading; differential leveling; profile leveling; contour survey grid method; plotting of contours; study of centrifugal pumping system and irrigation water measurement devices; study of different components of sprinkler irrigation systems; study of different components of drip irrigation in drip and sprinkler systems; study of soil and water conservation measures.

#### . Suggested Readings:

| 1 | Kanetkar, Kulkarni. Surveying and leveling, AVG Prakasan, 23rd edition . 2005   |
|---|---|
| 2 | Ojha, T.P. and A.M. Michael. Principles of Agricultural Engineering, Vol.II. Jain<br>Brothers New Delhi.3rd edition 2001. |
| 3 | Singhal, O.P. Agricultural Engineering, 1997  |

# 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year

# Fundamentals of Agri-Business Management

Course Credits: 2(1+1) Paper Code: 17010601

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

### Theory:

# Unit-1

Agribusiness: meaning, definition, structure of agribusiness (input-farm-product sectors), importance of agribusiness in the Indian economy, agribusiness management-distinctive features of agribusiness.

### Unit-2

Financial management of agribusiness: importance of financial statements, balance sheet, profit and loss statement, analysis of financial statements.

#### Unit-3

Agro-based industries: importance and need, classification of industries, types of agro-based

aculty of Agricultural Sciences 61 SGT University (Gurgaon Harvana) industries; marketing management: meaning, definitions, marketing mix, 4Ps of marketing, market segmentation and targeting; product life cycle.

### Unit-4

Project: definitions, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation; appraisal and evaluation techniques: NPV, BCR, IRR; characteristics of agricultural projects.

### Practical:

Study of input markets: seed, fertilizers, pesticides; study of output markets: grains, fruits, vegetables, flowers; study of product markets: retail trade commodity trading, value added products; preparation of projects: feasibility reports and project appraisal techniques; case study of agro-based industries.

. Suggested Readings:

| 1 | Downey, W.D., Troche, J.K. 1981. Agribusiness Management. Mc Graw Hill   |
|---|--|
|   | Inc.,New Delhi   |
| 2 | Gittinger, J.P.1982. Economic Analysis of Agricultural Projects. The Johns Hopkins University Press, Baltimore       |
| 3 | Alagumani, T., Chinnaiyan, P., Elangovan, S. 1998. Agricultural Management.<br>Publishers K9 International, Madurai. |
| 4 | Philip,K. 2004. Marketing Management. Prentice Hall, New Delhi.  |

# 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year Practical Crop Production-II (*Rabi Crops*) Course Credits: 1(0+1) Paper Code: 17010602

# Practical:

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 pest 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.

# 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year Farming Systems and Sustainable Agriculture Course Credits: 2(1+1) Paper Code: 17010603

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

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Sustainable agriculture: introduction, definition, goal and current concepts; land degradation and conservation of natural resources, LEIA and HEIA.

# Unit-2

Wasteland and their development; organic farming: definition principle and components.

# Unit-3

Farming systems: definition, principles and components; IFS models for wet land, irrigated dryland and dry-land situations

# Unit-4

Problems and prospects of present day agriculture

#### Practical:

Preparation of cropping systems for irrigated and dry-land situations; study of existing farming systems in nearby villages; preparation of integrated farming systems, model for wet lands; preparation of integrated farming systems model for dry-lands; preparation of enriched farm yard manure; preparation of vermi-compost; visit to urban waste recycling unit; study of profitable utilization of agricultural wastes; visit to poultry and dairy units to study resource allocation, utilization and economics; visits to organic farm to study various components and utilization; study of degraded lands.

11. Suggested Readings:

| 1 | Dahama, A.K. 2007. Organic Farming for Sustainable Agriculture. 2nd Edn. Published by AGROBIOS (India) Jodhpur |
|---|--|
| 2 | Gupta, P.K. 2006. Vermicomposting for Sustainable Agriculture. Published by AGROBIOS (India) Jodhpur           |
| 3 | Sharma, A.K. 2006. A Hand Book of Organic Farming. Published by AGROBIOS (India) Jodhpur                       |
| 4 | Sharma, A.K. 2005. Biofertilizers for Sustainable Agriculture. Published by AGROBIOS (India) Jodhpur           |

# 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year Modes of Transfer of Agricultural Technologies

Course Credits: 3(2+1) Paper Code: 17010604

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

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Communication: meaning, definition, models, elements and their characteristics, types and barriers in communication; extension programme planning: meaning, definitions of planning, programme, project, importance, principles and steps in programme development process, monitoring and evaluation of extension programmes.

#### Unit-2

Extension teaching methods: meaning, definition, functions and classification; 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-3

Mass contact methods: campaign, exhibition, *farmer fair*, radio and television: meaning, importance, steps, merits and demerits; factors influencing in selection of extension teaching methods and combination (media mix) of teaching methods; innovative information sources: internet, cyber cafes, video and teleconferences, kisan call centers, consultancy clinics.

#### Unit-4

Agricultural journalism: meaning, scope and importance, sources of news, types, merits and limitations; 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 (Farmers' Training Centre) and KVK (Krishi Vigyan Kendra).

### Practical:

Simulated exercises on communication; identifying the problems, fixing the priorities and selecting an 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 writing of scripts for radio and television; audio visual aids: selection, planning, preparation, evaluation and presentation of visual aids; planning and preparation of visual aids: charts, posters, power point slides; planning and preparation of agricultural information materials: leaflets, folders, pamphlets, news stories, success stories, handling of public address equipment (PAE) system, still camera, video camera and LCD & LED projectors.

# 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year Entrepreneurship Development and Communication Skills Course Credits: 2(1+1) Paper Code: 17010605

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

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#### Theory:

# Unit-1

Entrepreneurship development: concept of entrepreneurship, entrepreneurial and managerial characteristics, managing an enterprise, motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition.

#### Unit-2

Entrepreneurship development programmes; government schemes and incentives for promotion of entrepreneurship; government policy on small and medium enterprises (SMEs)/SSIs.

# Unit-3

Contract farming, public-private partnership; overview of agri-inputs industry; characteristics of Indian agricultural processing and export industry; export policies relevant to agriculture sector

#### Unit-4

Communication skills: meaning and process of communication; verbal and non-verbal communication; listening, note taking, writing skills, oral presentation skills and fidelity of communication.

# Practical:

Oral presentation skills; reading and comprehension of general and technical articles; preparation of business plan, visit to an entrepreneurial unit.

> 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year Farm Power and Machinery Course Credits: 2(1+1) Paper Code: 17010606

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

#### Theory:

### Unit-1

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

Unit-2

Tractors; types, selection of tractor and cost of tractor power

Unit-3

Tillage implements: primary and secondary tillage implements, implements for intercultural

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operations, seed drill, paddy transplanter

#### Unit-4

Plant protection equipment and harvesting equipment; equipment for land development and soil conservation

# Practical:

Study of different components of I.C. engine; study of working of four stroke engine; study of working of two stroke engine; study of mould- board (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 of paddy transplanter; 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; repair, adjustments and operation of sprayers & dusters.

#### 11. Suggested Readings:

| . 1 | Ojha, T.P. and A.M. Michael 2001. Principles of Agricultural Engineering, Vol.I. Jain Brothers New Delhi.3rd edition |
|-----|--|
| 2   | Sahay, Jagdiswar. 1977. Elements of Agricultural Engineering. Agro book Agencies                                     |
| 3   | Singhal, O.P. 1977. Agricultural Engineering,  |

# 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year **Ornamental Horticulture** Course Credits: 2(1+1) Paper Code: 17010607

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

# Unit-1

Importance and scope of floriculture in the state and country; cultivation of annuals, shrubs, hedges, climbers, bulbous plants, ornamental trees and roses

## Unit-2

History, concept and styles of gardens and their salient features with special reference to Mughal, Japanese and English gardens;

Aesthetic and big-aesthetic planning of public parks, schools, homes, etc

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#### Unit-3

Preparation and maintenance of lawns, rock gardens, hedges, edges, topiary, water gardens and indoor plants.

### Practical:

Identification of various ornamental plants; preparation of various types of borders; layout of gardens, parks and college compounds; trimming of shrubs, hedges, climbers and trees; raising of annuals and propagation of ornamental plants; practices in indoor gardening; visit to public parks and gardens.

6<sup>th</sup> Semester/ 3<sup>rd</sup> Year Introductory Nematology Course Credits: 3(2+1) Paper Code: 17010608

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

# Unit-1

Introduction, kinds and habitats of nematodes; history of phytonematology; economic importance of phytonematodes; gross morphology of plant parasitic nematodes

#### Unit-2

Classification of nematodes up to family level with emphasis on groups containing important plant parasitic genera; biology and ecology of plant parasitic nematodes

# Unit-3

Nature of damage and general symptomatology; principles and practices of nematode management

#### Unit-4

Diagnosis, hosts, distribution, biology, symptoms and management of important plant parasitic nematodes viz., *Meloidogyne* spp., *Heterodera avenae*, *Globodera rostochiensis* and *G. pallida*, *Radopholus similis*, *Hirschmanniella oryzae*, *Pratylenchus* spp., *Tylenchulus semipenetrans*, *Rotylenchulus reniformis*, *Anguina tritici*, *Aphelenchoides besseyi*, *Ditylenchus angustus* 

# Practical:

Collection of soil and plant samples; extraction of nematodes from soil and plant tissues; counting and estimation of nematode populations; killing, fixing and clearing nematodes; preparation of temporary and permanent mounts; study of major morphological characteristics; identification of important plant parasitic nematodes and symptoms caused by them; methods

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#### of nematode management.

| 1 | Gopal Swarup and Dasgupta D. R. 1986. Plant Parasitic Nematodes of India |
|---|--|
|   | Problems and Progress. Indian Agricultural Research Institute, New Delhi |
| 2 | Bhatti Walia   |

# 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year **Renewable Energy** Course Credits: 2(1+1) Paper Code: 17010609

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

### Unit-1

Energy sources: introduction, classification, energy from biomass, types of biogas plants, constructional details, biogas production and its utilization, agricultural wastes.

#### Unit-2

Principles of combustion, pyrolysis and gasification, types of gasifiers, producer gas and its utilization; Briquettes: types of briquetting machines, uses of briquettes, shredders.

#### Unit-3

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-4

Wind energy: types of wind mills, constructional details and application of wind mills; liquid biofuels, bio-diesel and ethanol from agricultural produce, its production and uses.

# Practical:

Constructional details of KVIC and Janta type biogas plants; constructional details of Deen Bandhu type biogas plants; field visit to biogas plants; constructional details of different types of gasifiers; testing of gasifiers; briquette preparation from biomass; study and efficiency of solar cooker; study and performance of a solar still; study and 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; study and performance of different types of wind mills; field visit to wind mills.

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# 6<sup>th</sup> Semester/ 3<sup>rd</sup> Year Diseases of Horticultural Crops & their Management Course Credits: 3(2+1) Paper Code: 17010610

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

# Unit-1

Economic importance, symptoms, cause, disease cycle and integrated management of diseases of citrus, mango, pomegranate, guava, sapota, mulberry

# Unit-2

Economic importance, symptoms, cause, disease cycle and integrated management of diseases of banana, grapevine, papaya, apple

#### Unit-3

Economic importance, symptoms, cause, disease cycle and integrated management of diseases of chilli, brinjal, bhindi, potato, crucifers, cucurbits, tomato, beans, onion,

#### Unit-4

Economic importance, symptoms, cause, disease cycle and integrated management of diseases of turmeric, coconut, oil palm, betelvine, coffee, tea, rose, chrysanthemum and jasmine.

#### Practical:

Diseases of beans, citrus, guava, and sapota; diseases of papaya, banana, pomegranate and ber; diseases of mango, grapes and apple; diseases of chilli, brinjal and bhindi; diseases of potato, tomato and crucifers; diseases of cucurbits, onion and betelvine; diseases of oil palm, coconut, tea, coffee and mulberry; diseases of rose, chrysanthemum and jasmine; field visits at appropriate time during the semester.

**Note:** Students must submit sufficient number of well mounted different diseased specimens related to different crops before the practical examinations.

6<sup>th</sup> Semester/ 3<sup>rd</sup> Year Environmental Science Course Credits: 2(2+0) Paper Code: 17010611

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly

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# distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

**Environment Introduction:** Biotic and Abiotic environment, Adverse effects of Environmental Pollution, Control Strategies, Various Acts and Regulations.

**Water Pollution:** Water Quality Standards for potable water, Surface and underground water sources, Impurities in water and their removal, Denomination, Adverse effects of domestic waste water and industrial effluent on surface water sources, Eutrophication of lakes, Self-purification of streams.

**Air Pollution:** Sources of air contamination, Adverse effects on human health, Measurement of air quality standards and their permissible limits, Measures to check air pollution, Greenhouse effect, Global warming, Acid rain, Ozone depletion.

**Bio-Medical Waste Management:** Introduction to Bio-Medical Waste, Types of Bio-Medical Waste, Collection of Bio-Medical Waste, Treatment and Safe Disposal of Bio-Medical Waste.

**Solid Waste Management**: Introduction to Solid Waste, Its collection and disposal, Recovery of resources, Sanitary land-filling, Vermin-composting, Hazardous waste management.

Land Pollution: Soil Conservation, Land Erosion, Afforestation.

**Ecology:** Ecology, Basics of Species, Biodiversity, Population Dynamics, Energy flow, Ecosystems.

**Social Issues and the Environment:** Sustainable development and life style, Urban problems relating to energy, Resettlement and rehabilitation of people, Environmental ethics, Consumerism and waste products.

**Water Harvesting and Rural Sanitation**: Water harvesting techniques. Different schemes of Rural Water Supply in Rajasthan Rural Sanitation Septic Tank Collection and disposal of wastes Bio-gas Community awareness and participation miscellaneous issues

**Renewable Sources of Energy:** Non-Conventional (Renewable) sources of energy. Solar energy. Wind energy. Bio-mass energy Hydrogen energy

# Module I: Commercial Agriculture

7<sup>th</sup> Semester/ 4<sup>th</sup> Year

# Nursery Technology for Commercial Forest Trees

Course Credits: 3(1+2) Paper Code: 17010701

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

#### Theory:

# Unit-1

Flowering and seed production in gymnosperms and angiosperms; development and maturation of seed/ fruit; modes of seed dispersal; determining optimal harvest maturity indices.

Unit-2

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Factors influence choice of collection methods; seed production area and seed orchard, methods of seed collection and processing, stage methods and seed testing techniques; seed certification.

#### Unit-3

Introduction and importance of nursery; types of nurseries; bare root, containerized and vegetatively produced nursery; physiology and nursery environment interaction affecting seedling growth; root culturing techniques.

#### Unit-4

Lifting windows, grading, packaging and storing and out planting.

# Practical:

Identification of forest seeds; seed sampling, different storage methods; seed quality testingpurity, viability and germination, collection and processing of seeds/ fruit; tests of viability viz., cutting, hydrogen peroxide, excised tetrozolium, embryo, seed health testing; introduction and identification of modern equipments and tools used in nursery; pre-sowing seed treatments; preparation of nursery beds and growing media for containerized nursery; sowing of seed and other intermediate nursery management operations; preparation and planting of cuttings; use of vegetative propagation methods such as budding, grafting and layering; precaution required in vegetative propagation, use of plant bio-regulators for rooting maintenance of nursery records; identification of nursery insects and diseased and their control measures; visit to nurseries; bare root nursery: nursery soil and water management, bed preparation, pre sowing seed treatments, seed sowing and intermediate operations viz., pricking, watering, fertilization, weeding and hoeing; containerized nursery: type and size of container including root trainers, selection of growing medium; types of green house and mist chamber for propagation; vegetative propagation: selection of superior phenotype, methods of propagation viz. cutting, budding, grafting and layering; factors affecting rooting of cuttings; structures, media fertilizers, sanitation and containers, source selection and management in vegetative propagation.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Production Technology of Economic Forest Trees

# Course Credits: 2(2+2) Paper Code: 17010702

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

#### Unit-1

Role of plantation forestry in meeting the wood demand: plantation forestry in India and abroad, purpose of plantation, factors determining scale and rate of plantation, land suitability and choice of plantation species.

# Unit-2

Production technology for quality planting stock, preliminary site preparation for establishing

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T University irdaon Haiyana) plantation, planting programme, time of planting, planting pattern, spacing, planting method; nutritional dynamics and irrigation of plantation, mechanization in plantation, protection and after care of plantation, pruning and thinning of plantation for quality wood production.

#### Unit-3

Rotation in plantation, failure of plantations, impact of interaction and integration of plantation forestry, protective afforestation, afforestation of inhospitable sites, ecological factors and long term productivity, sustainable yield from plantation.

#### Unit-4

Case studies in plantations of eucalyptus, casuarina, poplars, acacias, pine, sissoo, teak, sandal, bamboo, mahaneem, etc. wasteland plantation; industrial plantatio

#### Practical:

Analysis of plantation problems in Asia and India; preparation of plantation calendar, preliminary arrangement for a plantation programme, planting geometry and calculation of planting stock, study of different cultural operations and site preparation for plantation, studies on wood based industries, problems and prospects, management of *Eucalyptus tereticornis*, *Casuarina*, poplars, *Acacias*, Pine, sissoo, teak, *Prosopis spp*, bamboo, mahaneem plantations, production technology for energy plantations, commercial plantations, irrigation and plantations, economics of pulpwood, timber and energy plantations.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Commercial Floriculture Course Credits: 3(1+2) Paper Code: 17010703

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

#### Unit-1

Scope and strategies for growth of floriculture and landscaping in state and country

#### Unit-2

Planning and lay out of gardens.

#### Unit-3

Cultivation of rose, gladiolus, chrysanthemum, marigold and tuberose

# Unit-4

Greenhouse cultivation of roses, carnation and gerbera

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# Practical:

Identification of ornamental plants (annuals, bulbous plants, house plants, shrubs, creepers, trees, etc.), commercial flowers and their varieties; preparation of various types of border; lay out of lawns and maintenance; training and pruning of shrubs and trees; creation and use of topiary in landscaping; training and pruning of rose and chrysanthemum; planning and lay out of gardens; garden designs for public and private areas; propagation of ornamental plants; practices in cultural aspects of ornamental plants and economic flowers; storage of seed bulbs, corms, etc.; greenhouse cultivation of roses, carnation, gerbera; practice of flower arrangements in vases and indoor decoration; bonsai plants; harvesting, grading and packing of flowers; prolonging the shelf life of cut flowers; visit to public parks, gardens and local flower market.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Commercial Fruit Production Course Credits: 3(1+2) Paper Code: 17010704

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

#### Unit-1

Scope and strategies for growth of fruit cultivation in state and country

Unit-2

Unit-3

Planning and lay out of orchards.

High density planting; commercial varieties of fruit crops

#### Unit-4

Propagation techniques, crop regulation, fruit set and drop, harvest indices, ripening and export standards for various fruits.

# Practical:

Commercial propagation methods in mango, citrus, sapota and guava; fertilizer application and field observation of deficiency symptoms of micronutrients in major fruit crops; irrigation and fertigation practices in fruit crops; canopy management in mango (pruning, training, application of paclobutazol, etc.); training and pruning in grape, ber and pomegranate; flower and fruit drop and their control in mango and citrus; hormonal application to improve fruit set, fruit thinning, fruit size and quality in major fruit crops; harvesting indices in mango, banana, papaya and grape; harvesting methods in fruit crops; harvesting, desaping, pre-cooling, grading and palletisation and storage in mango; ripening methods in mango and banana; working out benefit cost ratios for mango, citrus, banana and grape; visit to commercial orchards of important fruit

Faculty of Agricultural Sciences 73 SGT University (Gurgaon Harvana) crops, local cold storage and export units of various fruits.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Commercial Production of Spices & Condiments Course Credits: 2(1+1) Paper Code: 17010705

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

#### Unit-1

History, scope and importance, area and production, uses, export potential of spices and condiments and their role in national economy; classification of spices and condiments, soil and climate requirement

### Unit-2

Propagation with seed, vegetative and micro propagation, systems and methods of planting, nutritional management, irrigation practices.

#### Unit-3

Weed control, mulching and cover cropping, training and pruning, role of growth regulators, shade crops and shade regulation, harvesting, post-harvest management, packaging, storage, value added products, methods of extraction of essential oil and oleoresins.

### Unit-4

Economics of cultivation of crops- cardamom, pepper, ginger, turmeric, clove, nutmeg, cinnamon, allspice, curry leaf, coriander, fenugreek, fennel, cumin, dill, celery, bishops weed, saffron, vanilla, thyme and rosemary.

#### Practical:

Identification of crops and varieties of spices and condiments; layout, seed treatment, propagation- sowing, planting; hoeing and earthing up, manuring and use of weedicides, training and pruning, fixing maturity standards, harvesting, curing, processing, grading and extraction of essential oils and oleoresins, visit to commercial plantations

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Commercial Production of Medicinal & Aromatic Plants Course Credits: 2(1+1) Paper Code: 17010706

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly

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SGT University (Gurgaon Haryana) distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

Unit-1

Importance and scope, origin, history, area and production of isabgol, opium poppy, aloe vera, liquorice

Unit-2

Importance and scope, origin, history, area and production of rauvolfla, periwinkle, ashwagandha, stevia

Unit-3

Importance and scope, origin, history, area and production of *Mentha* spp., palmrosa, lemongrass, *Ocimum* spp. (Aromatic plants)

Unit-4

Limiting factors and constraints of production and marketing of medicinal and aromatic plants and their possible remedies.

Practical:

Collection, identification, morphological description, seed bed preparation, nursery raising and propagation techniques for successful raising of medicinal and aromatic plants; chemical composition and processing techniques of different essential oils of common medicinal and aromatic plants.

7<sup>th</sup> Semester/ 4<sup>th</sup> Year Seed Production & Certification Course Credits: 3(1+2) Paper Code: 17010707

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

Unit-1

Importance of quality seed in relation to crop production; testing, release, notification and maintenance of varieties and hybrids of field crops

Unit-2

Classes of seed, generation system of seed multiplication; factors affecting deterioration and maintenance of genetic purity of crop varieties; factors affecting seed quality during production

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Principles and methods of seed production in self and cross-pollinated field and vegetable crops; hybrid seed production technology of field crops

# Unit-4

Seed certification: definition, phases and procedure for seed certification, field inspection; seed act and policies, WTO, IPR; seed village concept.

#### Practical:

Selection of suitable area for seed production; grow-out test for genetic purity analysis; identification of crop and objectionable weed seeds; identification of crop varieties/hybrids; determination of land requirement and isolation distance in field crops; seed production techniques of field and vegetable crops; seed production techniques of cross-pollinated crops; hybrid seed production in field crops; rouging (removal of off-type plants) in seed production plots; procedure for seed certification; field inspection at various stages of seed production; visit to seed production field and processing plants of various public and private seed companies.

# Module II: Crop Production

7<sup>th</sup> Semester/ 4<sup>th</sup> Year Crop Weather Interactions Course Credits: 3(1+2) Paper Code: 17010708

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

### Unit-1

Weather and its importance in agriculture; radiation spectrum, radiation laws for incoming and outgoing radiations, optical characteristics, solar radiation distribution in crop canopies, radiation and energy balance component and radiation use efficiency.

# Unit-2

Temperature concepts in agriculture: cardinal temperature, thermal indices, heat unit/growing degree day, photothermal unit, heliothermal unit, Vant Hoff law/Q10 and their merits and demerits; temperature and humidity profile.

### Unit-3

Concept of actual, potential and reference evapotranspiration, lysimeter, empirical methods of ET estimation and antitranspirants; climatological approach in irrigation scheduling; crop micro

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climate and its modifications: heat evading, heat trapping, mulches, wind break and shelterbelts.

#### Unit-4

Wind concept in crops: wind profile for dwarf and tall crops; soil temperature concept in crops; concept of climate change; weather hazards: frost, fog, hail storm, cyclone, floods, drought, heat wave etc.; weather based crop insurance.

#### Practical:

Visit to agromet observatory; working with thermometers, thermister, infrared thermometer, hygrometer, psychrometer, anemometer, pyranometer, albedometer, net radiometer, quantum sensor and lysimeter; agromet data base management; computation of radiation indices; computation of thermal indices; measurement and drawing of temperature and humidity profile in crops; computation of evapotranspiration using empirical methods.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Remote Sensing, GIS and Land Use Planning Course Credits: 3(1+2) Paper Code: 17010709

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

### Unit-1

Geographic co-ordinate system; map as a geographic model; types of maps and map reading

#### Unit-2

Basic concepts of remote sensing and GIS; geographical feature abstraction; geographic information- data, features and maps

Unit-3

Concept of raster and vector data

#### Unit-4

Land use planning: concept, techniques and factors governing present land use; land evaluation methods and soil suitability evaluation for different crops; land capability classification and constraints in application

# Practical:

Use of aerial photographs, RS imagery, toposheets and other maps; ground truth study using GPS and visual markings; supervised and unsupervised classification of digital image; digitization

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of maps; composing maps; use of arc catalogue, arc map, arc editor in GIS registration; georeferencing of images and maps, editing of attribute tables, field survey, overlay, network, proximity and spatial analysis; soil survey of project area: analysis of soil characteristics and soil classification, preparation of erosion risk assessment maps and report writing.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year **Crop Management** Course Credits: 3(1+2) Paper Code: 17010710

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

### Unit-1

Factors affecting crop growth and yield; management of environment for crop production

### Unit-2

Tillage, tilth and modern concepts of tillage; tillage implements and their use under different soil and crop conditions

#### Unit-3

Selection of crops and cultivars for different agro-climatic conditions; optimum time of sowing, seed rate, crop spacing and method of sowing for higher crop yield

#### Unit-4

Factors influencing crop response to fertilizers; integrated nutrient management, balanced fertilization; principles of harvesting, storage and post harvest management.

### Practical:

Study of crop responses to various agronomic practices, comparative economics of different crops and cropping systems; crop planning and layout for different agro-climatic situations; seedbed preparation for different crops with different tillage implements; demonstration of different methods of sowing; calibration of seed drill for different crops sowing; field layout of different methods of sowing; demonstration of different methods of fertilizer application; computing resource use and plant interaction indices and productivity efficiency for evaluating different crops under different levels of input and planting methods; visit to different agro-climatic zones of the state to study the various constraints of crop production.

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7<sup>th</sup> Semester/ 4<sup>th</sup> Year Water Management Course Credits: 3(1+2) Paper Code: 17010711

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

#### Unit-1

Watershed concepts, objectives of watershed management, delineation of watershed, inventory of natural resources in watershed; soil erosion, types of erosion and erosion resistant and erosion permitting crops, contour bunds, graded bunds, terracing, water harvesting structures; recycling of run off water- protective and supplemental irrigations; agronomic measures-suitable cropping systems, conservation tillage technique – in-situ conservations measures.

#### Unit-2

Micro irrigation: introduction, scope, different types of micro-irrigation systems, conventional surface and micro irrigation systems, principles, advantages, limitations and adaptability to crops; soil water availability, irrigation frequency, irrigation scheduling in micro irrigated crops; Wetting pattern and wetted area under sprinklers and emitters.

#### Unit-3

Fertigation - water soluble fertilizers; speciality fertilizers, components of micro irrigation system, design, installation of systems, operation and maintenance of systems fertigation equipments, uniformity co-efficient, monitoring and evaluation of these systems.

#### Unit-4

Problematic water –quality of water, classification of water, management of saline, sodic and sewage water, crop responses to problems waters, conjunctive use of water.

# Practical:

Study of agronomic measures of soil and moisture conservation, evaluation of treatment effect on moisture conservation, analysis of rainfall, estimation of runoff, study and design of conservation structures- contour bunds, study and design of graded bunds and terrace system, study of water harvesting structures, visit to Bunga watershed, visit to Balawas watershed, study of different components of sprinkler irrigation, study of layout of sprinkler irrigation, field determination of distribution pattern and uniformity co-efficient of sprinkler system, study the operation and maintenance of sprinkler system, study of different components of drip irrigation, layout of drip irrigation, operation and maintenance of drip system, calculation of application rate, field study of wetting patterns under an emitter in different soil types, fertigation through sprinkler and drip system of irrigation, calculation of fertilizer requirement for fertigation, assessment and interpretation of water quality data for use in irrigation, analysis of water for EC, pH, RSC; study of economics of micro irrigation, field visit to study the operation of sewage irrigation systems.

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# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Integrated Farming Systems Course Credits: 2(1+1) Paper Code: 17010712

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

#### Theory:

# Unit-1

Farming system : definition, scope and characteristics, classification, historical development of farming systems in India under different situations.

#### Unit-2

Concepts and components of farming systems, interaction between components; cropping system, complementary and competitive interaction; effect of preceding crops and associated crops.

# Unit-3

Indices for evaluation for cropping system; agronomic requirements in management of cropping system; sustainable agriculture, role of farming systems in sustainable agriculture, integrated farming systems, factors governing choice and size of enterprises and resources allocation in integrated farming system.

#### Unit-4

Models of integrated farming systems for irrigated ecosystems and rainfed ecosystems; importance and role of IFS's in organic farming, low input sustainable agriculture and low cost agricultural technologies.

#### Practical:

Preparation of cropping system for different farming situations having varying resource availability; working out input requirement and preparation of calendar of operations; case studies on integrated farming systems and development of IFS for different resource situations; calculation of economics of different farming system models; visit to different units of IFS in different agro climatic zones of Haryana

> 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Soil Management Course Credits: 3(1+2) Paper Code: 17010713

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

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#### Theory:

# Unit-1

Soil as water reservoir and role in water cycle; soil erosion: types, effects, mechanism and control/management.

#### Unit-2

Origin and basic concept of problematic soils and factors responsible

# Unit-3

Characterization of salt-affected soils and their morphological features; management of salt-affected, acid and physically constrained soils

# Unit-4

Management principles for sandy, clayey, red lateritic and dry land soils; soil health and soil quality; soil properties used as indicators of soil quality

# Practical

Measurement and estimation of runoff and soil loss; estimation of erosivity and erodibility indices; identification of problematic soils by analyzing for pH, ECE, soluble cations (Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>++</sup> and Mg<sup>++</sup>) and anions (Cl<sup>-</sup>, SO<sub>4</sub><sup>--</sup>, CO<sub>3</sub><sup>--</sup> and HCO<sub>3</sub><sup>-</sup>); lime requirements of acid soil; gypsum requirement of sodic soil; monitoring of soil salinity in the field; assessment of a soil for its quality in terms of physical, chemical and biological properties.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Seed Production & Certification

# Course Credits: 3(1+2) Paper Code: 17010714

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

### Theory:

# Unit-1

Importance of quality seed in relation to crop production; testing, release, notification and maintenance of varieties and hybrids of field crops

#### Unit-2

Classes of seed; generation system of seed multiplication; factors affecting deterioration and maintenance of genetic purity of crop varieties; factors affecting seed quality during production

#### Unit-3

Principles and methods of seed production in self and cross-pollinated field and vegetable crops; hybrid seed production technology of field crops

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Seed certification: definition, phases and procedure for seed certification, field inspection; seed act and policies, WTO, IPR; seed village concept.

#### Practical:

Selection of suitable area for seed production; grow-out test for genetic purity analysis; identification of crop and objectionable weed seeds; identification of crop varieties/hybrids; determination of land requirement and isolation distance in field crops; seed production techniques of field and vegetable crops; seed production techniques of cross-pollinated crops; hybrid seed production in field crops; rouging (removal of off-type plants) in seed production plots; procedure for seed certification; field inspection at various stages of seed production; visit to seed production field and processing plants of various public and private seed companies.

# Module III: Horticulture

7<sup>th</sup> Semester/ 4<sup>th</sup> Year Commercial Floriculture Course Credits: 3(1+2) Paper Code: 17010715

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

Unit-1

Scope and strategies for growth of floriculture and landscaping in state and country Unit-2

Planning and lay out of gardens.

Unit-3

Cultivation of rose, gladiolus, chrysanthemum, marigold and tuberose

#### Unit-4

Greenhouse cultivation of roses, carnation and gerbera.

#### Practical:

Identification of ornamental plants (annuals, bulbous plants, house plants, shrubs, creepers, trees, etc.), commercial flowers and their varieties; preparation of various types of border; layout of lawns and maintenance; training and pruning of shrubs and trees; creation and use of

Faculty of Agricultural Sciences SGT University (Gurgaon Haryana) topiary in landscaping; training and pruning of rose and chrysanthemum; planning and lay out of gardens; garden designs for public and private areas; propagation of ornamental plants; practices in cultural aspects of ornamental plants and economic flowers; storage of seed bulbs, corms, etc.; greenhouse cultivation of roses, carnation, gerbera; practice of flower arrangements in vases and indoor decoration; bonsai plants; harvesting, grading and packing of flowers; prolonging the shelf life of cut flowers; visit to public parks, gardens and local flower market.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Commercial Fruit Production Course Credits: 3(1+2) Paper Code: 17010716

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

# Unit-1

Scope and strategies for growth of fruit cultivation in state and country.

Unit-2

Planning and lay out of orchards.

#### Unit-3

High density planting; commercial varieties of fruit crops

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#### Unit-4

Propagation techniques, crop regulation, fruit set and drop, harvest indices, ripening and export standards for various fruits.

#### Practical:

Commercial propagation methods in mango, citrus, sapota and guava; fertilizer application and field observation of deficiency symptoms of micronutrients in major fruit crops; irrigation and fertigation practices in fruit crops; canopy management in mango (pruning, training, application of paclobutazol, etc.); training and pruning in grape, ber and pomegranate; flower and fruit drop and their control in mango and citrus; hormonal application to improve fruit set, fruit thinning, fruit size and quality in major fruit crops; harvesting indices in mango, banana, papaya and grape; harvesting methods in fruit crops; harvesting, desaping, pre-cooling, grading and palletisation and storage in mango; ripening methods in mango and banana; working out benefit cost ratios for mango, citrus, banana and grape; visit to commercial orchards of important fruit crops, local cold storage and export units of various fruits.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Nursery Management of Horticultural Crops Course Credits: 3(1+2) Paper Code: 17010717

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

### Theory:

# Unit-1

Introduction and importance of commercial nurseries in India and abroad; planning and execution of a commercial ornamental and fruit plant nurseries.

#### Unit-2

Basic general concepts concerning plant propagation; structure of vascular plants; choice of propagaton methods including micro-propagation; propagation by specialized vegetative structures specially in flower crops; seed and vegetative propagation.

#### Unit-3

Commercial methods of multiplication of flowers and fruit crops; plant propagating structures their importance in propagation: shade houses, tunnels, poly houses, fan and pad type of poly houses.

### Unit-4

Propagation media, characteristics, types of media, natural and synthetic; use of plant growth regulators in rooting of cuttings; study of tools, accessories and other equipment necessary for nursery production of ornamental and fruit crops.

#### Practical:

Preparation of lay out for establishment of mother plant block, commercial nurseries for fruit and ornamental plants; pre-germination treatment of seeds - scarification and stratification; seed viability tests; preparation of raised and flat seed bed to test germination of pre treated seed; preparation of potting mixtures; characteristics of individual media items; preparation of different types of cuttings (fruits and ornamentals); types of containers, dormancy breaking techniques, multiplication methods of bulbs, tubers and corms; methods of layering in ornamental and fruit crops, raising of rootstocks through seed and clone propagation; precuring, preparation of rootstocks for budding and grafting of important ornamental and fruit crops; commercial methods and practices of propagation of the crops: fruits: i) mango, ii) guava iii), chiku, iv) sweet orange and mandarins, v) litchi, (vi) datepalm, vii) ber, viii) aonla, ix) pomegranate, ornamental plants: i) roses ii) indoor decorative plants, iii) shrubs and bushes, planning for construction of shade houses, poly tunnels, poly houses and furniture suitable for propagation therein; preparation of media for micro-propagation, preparation of aseptic cultures for propagation of important ornamental plants like gerbera and chrysanthemum and fruit crops like banana; hardening of plants propagated through tissue culture; visit to commercial nurseries and tissue culture labs to study methods of propagation/ multiplication of plants.

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# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Processing & Value Addition in Horticultural Crops Course Credits: 3(1+2)

Paper Code: 17010718

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

#### Theory:

### Unit-1

Nutritional importance of fruits and vegetables; scope and importance of establishing processing industries in India; product mix, raw materials, manpower, capital, marketing, transport, availability of containers, publicity and role of government; food products order and quality control (Agmark).

#### Unit-2

Equipments used in the processing of various vegetables and fruit products; food spoilage: microbial spoilage and enzymatic spoilage; tin, glass and plastic containers; canning process: selection of fruits and vegetables, grading, washing, peeling, cutting, blanching, cooling, filling, exhausting, sealing, processing, cooling and storage; spoilage of canned foods: swell, hydrogen swell, springer, flipper, flat sour, leaker, breather and bursting of cans.

#### Unit-3

Preparation of value added products such as jam, jelly, marmalade, sauce and ketchup; fruit beverages: unfermented and fermented beverages, preparation and preservation of unfermented fruit beverages such as juice, squash and cordial; preparation of fermented beverages such as wine and vinegar; drying and dehydration- sun drying and mechanical dehydration- homemade drier, commercial dehydrators like kill drier, stack drier etc.

#### Unit-4

Preparation of pickles, pickling process– dry salting, fermentation in brine, kinds of spoilages in pickles– shriveling, bitter taste, blackening, dull or faded product, softness or slipperiness, sum formation, cloudiness, blemishes in pickles.

#### Practical:

Identification of machinery and equipments used in vegetable and fruit processing industry; canning of fruits and vegetables; material handling systems for horticultural crops; preparation of jam, jelly, juice, squash, cordial; fruit cheese, ketchup and sauce, pickles (mango, tomato, etc.), amchur; dehydration of banana, grape, onion and potato, visit to beverage and food processing industry, quality control in fruits and vegetable products.

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# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year **Protected Cultivation of Horticultural Crops** Course Credits: 3(1+2) Paper Code: 17010719

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

#### Theory:

#### Unit-1

Introduction, history, definition, world scenario, greenhouse effect, uses of greenhouse, status and scope of greenhouse technology in India, choice of crops for cultivation under greenhouse, problems/constraints of greenhouse cultivation and future strategies; planning and designing for greenhouses: site selection, greenhouse orientation, plant, layout, greenhouse utilities- water, electricity, etc.; types of greenhouse: classification based on the shape, material, utility and covering material; considerations for greenhouse establishment; design load calculations; materials for construction of greenhouse: fabrication of frame, covering/cladding of frame and environmental control system.

# Unit-2

Management of greenhouse: temperature, light, relative humidity, ventilation, carbon dioxide, irrigation, nutrition, pests and diseases; methods of greenhouse cooling and ventilation – natural and forced ventilation; roof shading, lathe shades and evaporative cooling with fan and pad system, high/low pressure misting and fog cooling system, maintenance of greenhouse equipments, heating, heat distribution and conservation practices; carbon dioxide solid and carbon dioxide; light control in greenhouse- shading and selection of light source.

#### Unit-2

Growing media: soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization, organic matter, pH control, pre-crop (base) fertilizer application and cultivation in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT)/hydroponics.

# Unit-4

Detailed production technology of vegetables: tomato, capsicum, lettuce and cucumber; cut flowers: rose, chrysanthemum, carnation, gerbera and anthurium; major diseases and insect pests and their management in greenhouse crops; marketing of greenhouse crops.

#### Practical:

Study of various types of greenhouse/poly house and their suitability for different crops, various framework materials used in the greenhouse construction; cladding materials used for covering the greenhouse, equipments used in the greenhouses, growing media used in raising of greenhouse crops and their preparation and pasteurization/sterilization; testing suitability of soil and water for growing crops in greenhouse; light, humidity and temperature management in greenhouse; calculation of nutrient requirement for different crops; fertigation requirements for greenhouse crops; working and requirement for reducing the water pH; estimation of E.C. in the fertigation solution; practicing training and pruning

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# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year **Commercial Vegetable Production** Course Credits: 3(1+2) Paper Code: 17010720

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

#### Unit-1

Prospects and constraints in commercial vegetable production in India

# Unit-2

Use of plant growth substances, use of mulches, off-season and organic vegetable production technology

#### Unit-3

Hi-tech methods in commercial production of potato, tomato, brinjal, chilli, okra, sweet potato, onion, garlic, peas and beans

### Unit-4

Hi-tech methods in commercial production of cauliflower, cabbage, radish, carrot, turnip, beet root, cucurbits, beet leaf and fenugreek.

### Practical:

Study of morphology of different parts of vegetable crops, cultural operations in raising vegetables, practices in use of plant growth regulators, weedicides, mulching, manures and fertilizers, irrigation and fertigation, training, pruning, staking and techniques of commercial vegetable production, visit to commercial vegetable farms.

> 7<sup>th</sup> Semester/4<sup>th</sup> Year Seed Production of Vegetable & Flower Crops Course Credits: 2(1+1) Paper Code: 17010721

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

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Scope and importance of vegetable and flower seed industry in India; different categories of seed, influence of self and cross pollination on seed setting, isolation distance and pollinators.

# Unit-2

Techniques of seed production: annual and biennial habits with reference to seed production in different vegetable and flower crops.

#### Unit-3

Factors influencing seed production on dioecious, monoecious and hermaphrodite crops; seed harvesting, curing, extraction, cleaning, drying, grading, packing and storage; viability maintenance

### Unit-4

Control of seed borne diseases and insect pests; minimum seed standards of vegetables and flower crops for germination; seed certification; Seed Act

#### Practical:

Classes of seed and its standards; seed viability tests; methods of breaking seed dormancy; identification and description of varieties in different vegetable crops and flowering annuals; isolation distance followed in different vegetable crops; planning and lay out of commercial vegetable seed production plots; raising of nursery in vegetable crops; hardening of seedlings; sowing of leguminous and cucurbitaceous vegetables; rouging (removal of off-type plants) in vegetable seed production plots at vegetative phase; rouging of vegetable seed production plots at vegetative phase; rouging of vegetable seed production plots at reproductive phase and pre-harvest stage; demonstration of seed extraction methods in tomato, brinjal, chilli, etc.; drying, cleaning, grading and packing of vegetable seeds; raising of nurseries of annual flowering plants; methods of planting flowering annuals; use of growth regulators in propagation of ornamental plants; propagation of flowering plants through cuttings, layering and budding; layout and establishment of commercial nurseries; visit to commercial nurseries; seed production farms of vegetables and flowers, seed testing laboratories, seed processing industries.

# Module IV: Plant Protection

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Chemical Weed Control

# Course Credits: 2(1+1)

Paper Code: 17010722

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

# Unit-1

Concept of weeds, their nature and distribution of weeds in relation to climate and soil

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Herbicides, their behaviour in plants, absorption, translocation and metabolism

# Unit-3

Introduction to adjuvants and their use; recommendation for use of herbicides in cropped and non-cropped situation with emphasis on aquatic and obnoxious weeds; mechanism of herbicide action and fate of herbicides in soil

### Unit-4

Compatibility of herbicides with other agrochemicals viz., insecticides and fertilizers; residual toxicity of herbicides in environment and plants; bioassay studies of herbicides **Practical:** 

Study of herbicide application equipments and calibrations; calculation of different soil and foliar applied herbicides available in different formulations; computing critical period of weed control of different field crops; study of phytotoxicity symptoms of herbicides in different crops; demonstration of method of herbicide application; economics of weed control practices; visits to problem areas.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Integrated Pest & Disease Management Course Credits: 4(2+2) Paper Code: 17010723

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of two (02) marks. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry twelve (12) marks.

Theory:

# Unit-1

Integrated Pest Management (IPM): history, definition and concept; concept of economic injury level and economic threshold, pest monitoring and surveillance.

#### Unit-2

Different tools of IPM including physical, mechanical, cultural, biological, host plant resistance, botanical, chemical, biorationals and biotechnological approaches.

# Unit-3

Integration of different IPM tactics; decision making systems; potential of IPM, its implementation and constraints; successful examples in IPM.

#### Unit-4

Integrated Disease Management (IDM): concept, advantage and importance, components of IDM their limitations and implications; development of IDM - basic principles, IDM application and implementation in some important crops; cost benefit and risk benefit ratio.

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### Practical:

Demonstration of pest management practices; use of pheromone, colour, sticky and light traps for monitoring and surveillance of pests; study of IPM module in cotton, rice, sugarcane, maize, fruits and vegetables; application of cultural, chemical and bio-control agents, their compatibility and integration in IDM, demonstration of IDM in some crops as project work.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Management of Non-Insect & Storage Pests Course Credits: 2(1+1) Paper Code: 17010724

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

### Unit-1

Distribution, host range, biology, population dynamics and pattern of damage of agriculturally important rodents and other mammals, birds, mites, slugs and snails.

#### Unit-2

Management strategies: physical (trapping, acoustic and visual) and chemical (poisons, repellents, fumigants and anticoagulants).

### Unit-3

Historical development of storage entomology

### Unit-4

Important pests associated with stored grains, their systematic position, identification, distribution, host range, biology, ecology, nature and extent of damage, and their management.

# Practical:

Identification of important rodents, birds, mites and other pests; damage assessment, population estimation and control operations of different pests; collection, identification and familiarization with the stored grain pests and damage caused by them; demonstration of fumigation technique.

7<sup>th</sup> Semester/ 4<sup>th</sup> Year Apiculture Course Credits: 2(0+2) Paper Code: 17010725

# **Practical:**

Important species of boney bees, caste differentiation and body structure; handling of colonies;

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bee flora; seasonal management practices; colony division; mass rearing techniques for queen bee; queen introduction, clipping and marking; bee pollination of crops; management of bacterial, viral and fungal diseases of honey bees; identification and management of parasitic mites, wax moths, ants and wasps, and predatory birds; honey extraction; pollen, propolis and bee venom collection; processing of bee wax; royal jelly.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Bio control Agents & Bio-Pesticides Course Credits: 3(1+2) Paper Code: 17010726

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

#### Theory:

### Unit-1

History and concept of biological control, different groups of biological control agents and biopesticides: macrobials (parasitoids and predators).

#### Unit-2

History and concept of biological control, different groups of biological control agents and biopesticides: microbials (bacteria, viruses, fungi, protozoa and nematodes) and botanicals (neem, pyrethrum, nicotine, rotenone etc.), their use in pest management along with advantages and limitations, methods of their mass production.

#### Unit-3

National and international agencies dealing with biological control; promising bio-control agents and their use in insect pest management

### Unit-4

Promising bio-agents (antagonists) of plant pathogens, their modes of action and compatibility with agro-chemicals; promising bio-control agents of plant parasitic nematodes and their modes of action

### Practical:

Identification of important groups of parasitoids, predators and microbial bio -control agents; laboratory multiplication of parasitoids, predators and microbial control agents; isolation, identification, culturing and mass multiplication of entomopathogenic nematodes; isolation of antagonists from soil, testing their efficacy by dual culture technique, compatibility with other bio-pesticides; demonstration of the efficacy and mass multiplication of promising bio-control agents (*Trichogramma* species and *Chrysoperla carnea*) of insect pests; demonstration of the efficacy and mass multiplication of promising bio-control agents (*Paecilomyces lilacinus* and *Pasteuria penetrans*) of plant parasitic nematodes.

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# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Pesticides & Plant Protection Equipment Course Credits: 2(1+1) Paper Code: 17010727

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

# Theory:

# Unit-1

Pesticides: classification, properties, entry and mode of action; formulation and toxicity of pesticides; factors affecting toxicity of pesticides; antidotes; problems associated with the use of pesticides.

# Unit-2

Pest control equipment: history of development, classification, constructional features, principles of working, operation, maintenance and selection.

# Unit-3

Fungicides: history, nature, properties, mode of action and formulations of antifungal, antibacterial chemicals, stickers, spreaders and other adjuvants.

#### Unit-4

Nematicides: their types, economic methods of nematicidal use.

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### Practical:

Familiarization with different formulations of pesticides, their preparation and use; toxicity to insects and plants; demonstration on use of various types of pest control equipment; study of factors affecting efficacy of pesticide spray; calibration of plant protection equipments; common troubles in the use of pest control equipment and their remedies; preparation of bordeux mixture and bordeux paints.

7<sup>th</sup> Semester/ 4<sup>th</sup> Year Nematode Pests of Crops & their Management Course Credits: 3(1+2) Paper Code: 17010728

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

Comprehensive account of crop losses caused by nematode pests

# Unit-2

Symptoms and management of nematode pests of important field and horticultural crops

### Unit-3

Nematode problems of mushrooms and protected cultivation

### Unit-4

Nematode management: terminology, ecology as the basis for nematode management, concepts of nematode control and management technology.

### Practical:

Field visits, isolation and identification of nematodes associated with field, vegetable, fruits crops, mushroom and protected cultivation; demonstration of nematode management technology: plastic mulching, summer solarisation, application of chemical nematicides and bioagents.

7<sup>th</sup> Semester/ 4<sup>th</sup> Year Mushroom Cultivation Course Credits: 2(0+2) Paper Code: 17010729

### Practical:

Mushroom fungi: introduction, nutritional value, edible and poisonous types, edible mushrooms; equipment and sterilization techniques for culture media; isolation and purification of cultures; *Pleurotus, Volvariella, Calocybe* and *Agaricus*; medicinal value of mushrooms; mother spawn production, multiplication of spawn, cultivation techniques, harvesting, packing and storage; problems in cultivation: diseases, pests, nematodes, weed moulds and their management strategies; economics of cultivation, post harvest technologies.

# Module V: Post-Harvest Technology & Value Addition

7<sup>th</sup> Semester/ 4<sup>th</sup> Year

Post-Harvest Technology of Horticultural Crops

Course Credits: 3(1+2) Paper Code: 17010730

Note : The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

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Post-harvest management, its importance and scope

# Unit-2

Methods of determining maturity indices

# Unit-3

Post-harvest operations like harvesting, sorting, grading, packaging, storage, marketing and transportation of important fruit crops.

### Unit-4

Post-harvest operations like harvesting, sorting, grading, packaging, storage, marketing and transportation of important vegetable crops

# Practical:

Identification and handling of equipment of post-harvest management and processing; practices in harvesting, grading, packaging and storage; visit to processing units.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year

# Unit Operations in Processing & Development of New Products Course Credits: 4(1+3) Paper Code: 17010731

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

# Unit-1

General principles and methods involved in fruit processing.

Unit-2

Unit operations in canning, freezing and dehydration of fruits and vegetables

#### Unit-3

Establishment of processing unit, F.P.O.; specifications of various products

#### Unit-4

Preparation and preservation of fruits and vegetables products

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# Practical:

Preparation of fruit beverages (fermented and non-fermented), jam, jellies, marmalades, cheese, fruit bar and toffees, candies and preserves, pickles and chutneys; canning and

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dehydration of important fruits and vegetables; visit to a commercial scale processing factory.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Integrated Storage Management of Fruits & Vegetables Course Credits: 3(1+2) Paper Code: 17010732

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

# Unit-1

Short term and long term storage; factors affecting storage behaviour; storage losses.

# Unit-2

Storage structures for potato and onion.

# Unit-3

Evaporative cool chambers; cold storage, modified atmosphere storage, controlled atmosphere storage.

#### Unit-4

Storage compatibility of mixed crops; storage disorders; cold chain management

Practical:

Storage studies under ambient and modified atmosphere conditions; study of evaporative cool chambers and their efficiency under different seasons; use of pre and post-harvest treatments like growth regulators, waxes and edible coatings to enhance shelf life; study of storage disorders of onion, potato and available fruits and vegetables; visit to cold storage.

7<sup>th</sup> Semester/ 4<sup>th</sup> Year Processing of Cereals, Pulses, & Oilseed Crops Course Credits: 3(1+2) Paper Code: 17010733

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

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Status of production and utilization of food grains in Haryana, India and the world.

#### Unit-2

Cereal varieties and their suitability for processing, milling of wheat, rice and corn; processing of cereals to prepare different products, baked, extruded, breakfast cereals, ready to cook and ready to eat products.

#### Unit-3

Pulses: varieties, suitability of processing, importance, milling, processing and preparation of different products.

#### Unit-4

Oilseeds: varieties, importance, suitability of processing, oil extraction and preparation of different products.

### Practical:

Study of various types of equipments used for processing of cereal, pulses and oilseeds; quality evaluation of grains, milling of wheat and rice; evaluation of flour quality, preparation of baked products: biscuits, cake, bread etc; preparation of extruded products: noodles, pasta and ready to eat extruded products; evaluation and grading of rice, cooking quality of rice; milling of rice, parboiling of paddy; milling of pulses and preparation of value added products, evaluation of quality of oilseed and oils; visits to flour, dal and oil mills.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Post-Harvest & Storage Technology of Cut & Dry Flowers Course Credits: 3(1+2)

# Paper Code: 17010734

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

# Unit-1

Importance of post harvest technology, factors responsible for post harvest losses in flowers, post-harvest physiology of flowers

# Unit-2

Methods to improve the shelf life of cut flowers, post-harvest handling of cut flowers: grading, packing, transportation and marketing.

#### Unit-3

aculty of Agricultural Sciences

GT University Gurgaon Haryana) Flower arrangements, storage of cut flowers, types of storage.

# Unit-4

Dry flowers: importance, uses and export potential, methods of dehydration of flowers, methods to improve the shelf life of dried flowers; home scale drying flower.

# Practical:

Maturity indices of various flowers, grading and packing of cut flower, practices in different types of flower arrangement, use of chemicals for increasing vase life, cold chain, drying of flowers through different methods, dry flower arrangements, visit to flower export houses.

# 7<sup>th</sup> Semester/ 4<sup>th</sup> Year Post-Harvest Technology of Spices, Medicinal, Aromatic, & Plantation Crops Course Credits: 4(1+3) Paper Code: 17010735

Note: The question paper will have two parts—Part A and Part B. Part A will be compulsory with 10 questions, each of one (01) mark. Part B will have seven (07) questions, evenly distributed over the entire syllabus. The examinee shall have to attempt five out of seven questions from Part B. Each question in this Part shall carry six (06) marks.

Theory:

#### Unit-1

Introduction, factors affecting the maturity and quality of spices, medicinal, aromatic and plantation crops.

### Unit-2

Post-harvest handling, types of equipments required for drying, processing, grading, packing, storage and marketing of spice crops: ginger, turmeric, black pepper, cardamom, clove, cinnamon, garlic, chilli, coriander, cumin, fenugreek

### Unit-3

Post-harvest handling, types of equipments required for drying, processing, grading, packing, storage and marketing of medicinal plants: opium, *Solanum viarum*, isabgol, senna, *Catharanthes roseus*, guggul, coleus, aloe vera, *Ocimum* sp., *Acorus*, aswagandha and *Rauvolfia serpentine*; aromatic crops: lemon grass, citronella, palmarosa, vetiver, genanium, mint, davana and eucalyptus.

# Unit-4

Post-harvest handling, types of equipments required for drying, processing, grading, packing, storage and marketing of plantation crops: coconut, oil palm cashew, tea, coffee, areca-nut, cacao, rubber, betel vine; extraction of essential oils, storage and uses of aromatic oils; equipments for extraction of essential oil in aromatic plants.

Practical:

aculty of Agricultural Sciences GGT University 97 Gurgaon Haryana) Study of maturity standards in spices, medicinal, aromatic and piantation crops, post-harvest handling and processing in turmeric, ginger (dry ginger and paste), garlic and chilli, coriander, cumin and fenugreek; equipments required for processing of spices; establishment of processing units for spice crops; visit to processing units of plantation and spice crops; practices in judging the maturity and maturity standard in lemon grass, citronella, palmarosa and vetiver, geranium and eucalyptus; maturity standards, post-harvest handling in *Solanum viarum*, isabgol, *Aloe vera* and guggul; quality standards in medicinal and aromatic plants; equipments and their functioning for post-harvest handling and process distillation of medicinal and aromatic plants; visit to essential oil extraction units and medicine manufacturing units.

# 8<sup>th</sup> Semester/ 4<sup>th</sup> Year Rural Agricultural Work Experience (RAWE) Course Credits: 20(0+20) Paper Code: 17010801

# Practical:

Village Attachment Experiential Learning Industry Attachment Report writing & presentation - 03 credits
- 10 credits
- 05 Credits
- 02 Credits

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