

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

B.Sc. (Hons. in Agriculture) (AGRB4PUP) Semester-III

COURSE CODE	SUBJECT	THEORY		PRACTICAL	TOTAL
		EXTERNAL	INTERNAL		
AGRON-201	Crop Production Technology – I (Kharif Crops)	36	14 ^a	50	100
GPB-201	Fundamentals of Plant Breeding	74	26 ^c	50	150
ECO-201	Agricultural Finance and Cooperation	74	26 ^c	50	150
COMP-201	Agri- Informatics	36	14 ^a	50	100
AGRI-ENG-201	Farm Machinery and Power	36	14 ^a	50	100
HORT-201	Production Technology for Vegetables and Spices	36	14 ^a	50	100
EVS-201	Environmental Studies and Disaster Management	74	26 ^c	50	150
STAT-201	Statistical Methods	36	14 ^a	50	100
LPM-201	Livestock and Poultry Management	110	40 ^d	50	200
(QUALIFYING SUBJECT)					
EVS-202	ENVIRONMENTAL & ROAD SAFETY AWARENESS (QUALIFYING PAPER)	70	30 ^e	-	100
	TOTAL	512	188	450	1150

The breakup of marks for the internal assessment for theory (According to RUSA guidelines) will be as under:

Average of two mid-semester tests/Internal Examinations	: a6/ b10/ c10/ d/16
Written Assignments/Project Work	: a6/ b10/ c10/ d/16
Attendance	: a2/ b5/ c6/ d8

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-III

AGRON-201: Crop Production Technology-I (Kharif Crops)

Max Marks: 100
Theory: 36 marks

Internal Assessment: 14 marks
Practical: 50 marks

THEORY

Teaching: 1 hrs. per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The candidates are required to attempt two questions from each section A and B and the entire section C.

SECTION-A

1. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Cereals – Rice and Maize
2. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Pearl millet and Finger millet
3. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield pulses - Pigeon pea, Moong bean and Urd bean
4. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield- oilseeds- Groundnut, and Soybean

SECTION-B

5. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield fibre crops- Cotton and Jute
6. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of forage crops- Napier and Sorghum
7. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Cowpea and Cluster bean
8. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kodo millet.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. To study the rice nursery preparation
2. To study the transplanting of rice
3. To study the sowing of soybean, pigeon pea, mungbean, maize, groundnut and cotton.
4. To study effect on seed size on germination and seedling vigour of kharif crops
5. To study about the effect of sowing depth on germination of kharif crops.
6. Identification of weeds in kharif season crops
7. To study top dressing and foliar feeding of nutrient.
8. To study the yield contributing characters and yield calculation of kharif season crops.
9. To study of crop varieties and important agronomic experiments at experimental farm.
- 10 To study the forage experiments
11. To study the morphological description of kharif season crops.
12. Visit to research centers of related crops.

Recommended Books

1. Prasad R. (2002) Textbook of field crops production. Textbook of field crops production.
2. Reddy T. (2016). Yellamanda and Reddy, G.H. Sankara. Principles of Agronomy (2nd ed), Kalyani Publishers, Ludhiana
3. Gupta OP. (2005). Weed Management: Principles and Practices (2nd ed) Agrobios (India) Jodhpur.
4. Singh C., Singh P. and Singh R. (2003). Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
5. Singh SS. (1998). Crop Management: Under irrigated and rainfed conditions.
6. Singh SS. (1993). Principles and Practices of Agronomy, Kalyani Publishers, New Delhi.
7. Reddy TY. and Reddi, GHS. (1993). Principles of Agronomy, Kalyani Publishers, New Delhi.
8. Maiti,S., Hedge, MR. and Chhattopadhyay SB. (1988). Handbook of Annual Oilseed Crops. Oxford & IBH Publishing Co., New Delhi.
9. Jaiswami LH. and Baldeo B. (1990). Advances in Pulse Production Technology, ICAR, New Delhi.
10. Rathore PS (2000). Techniques and Management of Field Crop Production. Agrobios (India), Jodhpur.
11. Rathor, PS. and Sharma SK. (2003). Scientific Pulse Production. Yash Publishing House, Bikaner.
12. Reddy SR. Agronomy of Field Crops. Kalyani Publishers, New Delhi.
13. Prasad R. Field crops Vol.I & II. ICAR, New Delhi.
14. Ray S, (2007). editor. Handbook of agriculture in India. New Delhi: Oxford University Press;.
15. Pearson : Handbook of Agriculture ICAR, New Delhi.
16. Fugh BM : Production of field Crops in India, Kitabistan, Allahabad
17. Harlison CM : Field Crops, Mc Graw Hill Book Co., New Delhi.
18. P.A.U Bulletin: Package of Practices for Kharif Crops.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

GPB-201: Fundamentals of Plant Breeding

Max Marks: 150
Theory: 74 marks

Internal Assessment: 26 marks
Practical: 50 marks

THEORY

Teaching: 2 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 11 marks each. Section C will consist of 15 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each from section A and B and the entire section C.

Section A

1. Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding.
2. Modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance;
3. Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept; Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes
4. Heterosis and inbreeding depression; development of inbred lines and hybrids, composite and synthetic varieties; Concepts of population genetics and Hardy-Weinberg Law

Section B

5. Breeding methods in asexually propagated crops, clonal selection and hybridization.
6. Maintenance of breeding records and data collection; Wide hybridization and pre breeding.
7. Polyploidy in relation to plant breeding; Mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses.
8. Biotechnological tools-DNA markers and marker assisted selection; Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Plant Breeder's kit
2. Study of germplasm of various crops.
3. Study of floral structure of self-pollinated and cross-pollinated crops.
4. Emasculation and hybridization techniques in self- & cross-pollinated crops.
5. Consequences of inbreeding on genetic structure of resulting populations.
6. Study of male sterility system.
7. Handling of segregation populations.
8. Methods of calculating mean, range, variance, standard deviation, heritability.
9. Designs used in plant breeding experiments, analysis of Randomized Block Design.
10. To work out the mode of pollination in a given crop and extent of natural out-crossing. Prediction of performance of double cross hybrids.

Recommended Books:

1. Poehlman, J. M. (2013). *Breeding Field Crops*. Germany: Springer Netherlands.
2. Allard, R. W., Allard, R. W. (1999). *Principles of Plant Breeding*. United Kingdom: Wiley.
3. Dabholkar A.R. (2006). *General Plant Breeding*. India: Concept Publishing Company.
4. Chopra, V. L. (Ed.). (1989). *Plant Breeding: Theory and Practice*. South Asia Books.
5. Singh, P. (2007). *Essentials of plant breeding*. Kalyani publishers.
6. Singh, B.D. & Shekhawat N.S. (2019). *Plant Breeding In 21st Century*. Scientific Publishers.
7. Singh, B. D., & Shekhawat, N. S. (2017). *Molecular Plant Breeding*. Scientific Publishers.
8. Allard, R. W., Allard, R. W. (1999). *Principles of Plant Breeding*. United Kingdom: Wiley.
9. Sharma, J. R. (1994). *Principles and Practice of Plant Breeding*. India: Tata McGraw-Hill Pub..
10. Chaudhary, R. C. (2017). *Introductory Principles of Plant Breeding*. India: CBS Publishers & Distributors.
11. B.D. Singh. *Plant breeding : principles and methods*. Kalyani Publishers, Ludhiana.
12. Hays and Garber. *Breeding crop plants*. Mc Graw Hill Publications, New York
13. G K Kallo. *Breeding of vegetables*. Panima publishers, New Delhi

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

14. W.R. Fehr. Principles of cultivar development: theory and technique (Vol. 1). Macmillan Publishing Company, New York.
15. D.S. Falconer. Introduction to quantitative genetics. Longman Scientific & Technical, Longman Group, UK, Ltd., England.
16. R.K. Singh and B.D. Chaudhary. Biometrical methods in quantitative genetic analysis. Kalyani Publishers, Ludhiana.
17. K. Mather and J.L Jinks. Introduction to Biometrical genetics. Chapman and Hall, London
18. B D Singh. Fundamental of Plant breeding. Kalyani. India.
19. Pundan Singh. Essentials of plant breeding. Kalyani. India
20. G. S. Chahal and S.S. Gosal. (2002). Principles and Procedures of Plant Breeding. Narosa Publishing House, New Delhi.
21. Poehlman, J.M. and Borthakar, D. (1995). Breeding Asian Field Crops. Oxford & IBH Publishing Co., New Delhi

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

ECO-201: Agricultural Finance and Co-Operation

Max Marks: 150
Theory: 74 marks

Internal Assessment: 26 marks
Practical: 50 marks

THEORY

Teaching: 2 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 11 marks each. Section C will consist of 15 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each from section A and B and the entire section C.

Section-A

1. Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification.
2. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks,
3. Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost.
4. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance and Credit Guarantee Corporation of India. Cost of credit.

Section-B

5. Recent development in agricultural credit. Preparation and analysis of financial statements, Balance Sheet and Income Statement.
6. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.
7. Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.
8. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise.
2. Analysis of progress and performance of cooperatives using published data.
3. Analysis of progress and performance of commercial banks and RRBs using published data.

PUNJABI UNIVERSITY, PATIALA

Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

4. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures.
5. Estimation of credit requirement of farm business – A case study.
6. Preparation and analysis of balance sheet – A case study.
7. Preparation and analysis of income statement – A case study.
8. Appraisal of a loan proposal– A case study.
9. Techno-economic parameters for preparation of projects.
10. Preparation of Bankable projects for various agricultural products and its value added products.
11. Seminar on selected topics.

Recommended Books:

- Johl T.R. (2007). Fundamentals Of Farm Business Management. Kalyani Publishers.
- Subba Reddy, S., Raghu Ram, P. (1996). Agricultural Finance and Management. India: Oxford & IBH Publishing Company.
- Ganvir, B., Warade, S. (2015). Textbook of Agricultural Finance and Cooperation. India: Agrotech Publishing Academy.
- Lekhi, R. K. (1996). Agricultural Economics: An Indian Perspective. India: Kalayani Publishers.
- Agricultural Economics. (2006). India: Oxford & IBH Publishing Company Pvt. Limited.
- Barkley, A., Barkley, P. W. (2016). Principles of Agricultural Economics. United Kingdom: Taylor & Francis.
- Terms of Trade by Alan V. Deardorff. ...
- International Trade Theory by Wei-Bin Zhang. ...
- International Trade and Economic Dynamics by Takashi Kamihigashi (Editor); Laixun Zhao (Editor) ...
- International Trade and Multinational Activity by Julian EmamiNamini. ...
- World Trade Politics by Deese.
- Principles of agricultural economics” by Sundar
- Principles of Agricultural Economics: Markets and Prices in Less Developed Countries” by David Colman and Trevor Young
- Agricultural Economics and Indian Agriculture By S.S. Chhina.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

COMP-201 : Agri-Informatics

Max Marks: 100
Theory: 36 marks

Internal Assessment: 14 marks
Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

SECTION A

1. Introduction to Computers, Operating Systems, definition and types.
2. Applications of MSOffice for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture World Wide Web (WWW): Concepts and components.
3. Introduction to computer programming languages, concepts and standard input/output operations.
4. E-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.

SECTION B

5. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc;
6. Geospatial technology for generating valuable agri-information.
7. Decision support systems, concepts, components and applications in Agriculture,
8. Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Study of Computer Components, accessories, practice of important DOS Commands.
2. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management.
3. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document.
4. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.

PUNJABI UNIVERSITY, PATIALA

Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

5. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW).
6. Introduction of programming languages.
7. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools.
8. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision support System.
9. Preparation of contingent crop planning

Recommended Books:

1. Gene Wrisskp of (1998) Abc's Of Excel'
2. Sharma K.V.S. (2001) S imp le: Cu It Yourself On Pc. Prent ice
3. Capron.H.L. (1996) Computer. —Tools For An Informatio n Age -Fourth Eclidor. Berijimiin /Cummings, New York.
4. Co lin Ha ynes. (1990) The. Computer Virus Protect ion Handbook.Bpb
5. Peter Nortons. (2001)1:-Introduction To Computer; —Fourth Edition. Tata Iv.,: Publishing Co. Ltd. New Delhi.
6. Vanitha, G. (2011). Agro-Informatics. India: New India Publishing Agency.
7. Jwel Bhuiya, Jayashankar PradhanSubrat K. Mahapatra, Subrata K. Mohanty (2019). Introductory Agri-Informatics. Jain Brothers

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

AGRI-ENG-201 : FARM MACHINERY AND POWER

Max Marks: 100
Theory: 36 marks

Internal Assessment: 14 marks
Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

SECTION-A

1. Status of Farm Power in India, Sources of Farm Power, I.C. engines, working principles of I.C engines, comparison of two stroke and four stroke cycle engines.
2. Study of different components and terminology of I.C. engine and solved problems.
3. Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor,
4. Familiarization with Power transmission system: clutch, gear box, differential and final drive of a tractor.

SECTION-B

5. Tractor types, cost analysis of tractor power and attached implement.
6. Familiarization with primary and secondary tillage implement, Implement for hill agriculture, implement for intercultural operations.
7. Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples,
8. Familiarization with Plant Protection equipment and familiarization with harvesting and threshing equipment.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Study of different components of I.C. engine.
2. To study air cleaning and cooling system of engine.
3. Familiarizations with clutch, transmission, differential and final drive of a tractor.
4. Familiarization with lubrication and fuel supply system of engine.
5. Familiarization with brake, steering, hydraulic control system of engine.
6. Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture.
7. Familiarization with different types of primary tillage implements: mould plough, disc plough, chisel plough and subsoiler plough.
8. Familiarization with different types of secondary tillage implements: disc harrow, patela
9. Familiarization with seed cum fertilizer drills their seed metering mechanism and calibration,
10. Familiarization with planters and transplanter.
11. Familiarization with different types of sprayers and dusters.
12. Familiarization with different intercultivation equipment.
13. Familiarization with harvesting and threshing machinery.

Recommended Books:

1. Michal AM and Ojha TP, Vol-II, Principle of Agriculture Engineering, Jain Brothers, New Delhi.
2. Sahay J, Elements of Agriculture Engineering, Standards Publishers; 2009,
3. Donnel Hunt, Farm Power and Machinery Management,
4. Surender singh, Farm Machinery Principles and applications, ICAR publication, 2007,
5. Smith KP, Farm Machinery and Equipments; Tata Mc Graw hill Publishing Co. New Delhi,
6. D N & S Mukesh Sharma, Farm Power and Machinery Management Vol. – 1,
7. Farm Power and Machinery Management” by Donnell Hunt and David Wilson,
8. Fred R Jones and W H Alfred, Farm Power and Tractors

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-III

HORT-201: Production Technology for Vegetable and Spices

Max Marks: 100

Internal Assessment: 14 marks

Theory: 36 marks

Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

SECTION A

1. Importance of vegetables & spices in human nutrition and national economy, kitchen gardening.
2. Discuss about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of (Tomato, Brinjal, Chilli, Capsicum)
3. Discuss about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of Cucumber, Melons, Gourds, Pumpkin.
4. Discuss about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of French bean, Peas.

SECTION B

5. Discuss about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of Cole crops such as Cabbage, Cauliflower, Knol-khol
6. Discuss about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of Bulb crops such as Onion, Garlic
7. Discuss about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of Root crops such as Carrot, Raddish, Beetroot

PUNJABI UNIVERSITY, PATIALA

Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

8. Discuss about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of Tuber crops such as Potato and leafy vegetables such as Amaranth, Palak (Perennial vegetables).

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Identification of vegetables crops . and their seeds.
2. Identification of spices.
3. Identification of seeds of vegetable crops.
4. Nursery raising.
5. Direct seed sowing and transplanting.
6. Study of morphological characters of different vegetables.
7. Study of morphological characters of different spices.
8. Fertilizers applications.
9. Harvesting & preparation for market.
10. Economics of vegetables and spices cultivation.

Recommended Books:

1. Thamburaj, S.(2014).Text book of vegetable, tuber crops and spices. ICAR, New Delhi.
2. Choudhary, B.R. (2009) AText book on production technology of vegetables. Kalyani Publishers, Ludhiana;
3. Bose T.K. (2002). Vegetable Crops. Nayaprakash. Kolkata ;
4. Hazra, P. (2011) Modern Technology in Vegetable Production. New India Publishing Agency. New Delhi;.
5. Dhaliwal, M.S. (2008)Handbook of Vegetable Crops. Kalyani Publishers. Ludhiana.
6. Singh, U. (2008) Indian Vegetables. Anmol Publications. Pvt. Ltd .New Delhi
7. Yawalkar, K S. (2004)Vegetable crops in India. Agri-Horticultural Pub. House. Nagpur
8. Rana, M.K. (2008) Olericulture in India. Kalyani Publishers, Ludhiana.
9. Hazra, P. (2006)Vegetable science. Kalyani Publishers, Ludhiana.
10. Chadha, K.L.(1993). Advances in Horticulture. Malhotra Publishing house, New Delhi;
11. Premnath, Sundari Velayudhan and Singh, D.P., Vegetables for the tropical region. ICAR.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

EVS-201: Environmental Studies and Disaster Management

Max Marks: 150

Internal Assessment: 26 marks

Theory: 74 marks

Practical: 50 marks

THEORY

Teaching: 2 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 11 marks each. Section C will consist of 15 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each from section A and B and the entire section C.

Section A

1. Multidisciplinary nature of environmental studies- Definition, scope and importance. Natural resources- Renewable and non-renewable resources and their associated problems. Forest resources- Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forest and tribal people. Water resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
2. Mineral resources- Use and exploitation, environmental effects of extracting and using mineral resources. Food resources- World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources- Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles.
3. Ecosystems- Concept, structure and function of an ecosystem. Producers, consumers and decomposers, energy flow in the ecosystem, ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of forest, grassland, desert and aquatic ecosystems.
4. Biodiversity and its conservation- Introduction, definition, genetic, species, ecosystem diversity and biogeographical classification of India. Value of biodiversity- Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity- Habitat loss, poaching of wildlife, man-wildlife conflicts, endangered and endemic species of India. In-situ and Ex-situ conservation of biodiversity.

PUNJABI UNIVERSITY, PATIALA

Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Section B

5. Environmental pollution- Definition, cause, effects and control measures of air, water, soil, marine, noise and thermal pollution and nuclear hazards. Solid waste management- Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social issues and the environment- Unsustainable to sustainable development, urban problems related to energy. Water conservation, rain water harvesting, watershed management.
6. Environmental ethics- Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Environment protection acts- Air (Prevention and control of pollution) act, water (Prevention and control of pollution) act, wildlife protection act, forest conservation act, Issues involved in enforcement of environmental legislation, public awareness.
7. Human population and the environment- Population growth, variation among nations, population explosion. Role of Information Technology in environment and human health. Natural disasters- Meaning and nature, types (floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves, global warming, sea level rise, ozone depletion) and effects. Man-made disasters- Nuclear, chemical, and biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents.
8. Disaster management- International strategy for disaster reduction at national and global levels; National disaster management framework- Financial arrangements, role of NGOs, community-based organizations and media, central, state, district and local administration, armed forces in disaster response, police and other organizations. Feeding the people struck by the disaster, managing house and dress need during disaster.

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Visit to a local area to document environmental assetriver/forest/grassland/hill/mountain.
2. Visit to a local polluted site-Urban/rural/industrial/agricultural.
3. Study of common plants,
4. Study of insects
5. Study of birds
6. Study of simple ecosystems i.e., pond, river, hill slopes, etc
7. Case studies on Disaster Management
8. Study of Sewage Treatment Plant (STP)
9. Study of biodegradable and non biodegradable resources

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Recommended Books :

1. Bharucha, E. (2005). Text book of environmental studies. University Grants Commission, University Press, New Delhi.
2. Kapur, A. (2005). Disasters in India: Studies of grim reality. Rawat publication, Jaipur.
3. Chauhan, B.C. (2008). Environmental studies. University Science Press, New Delhi.
4. De, A.K. (2010). Environmental chemistry. Willey Eastern ltd. New Delhi.
5. Singh, S. and Singh, J. (2013). Disaster Management. Pravilika Publication Allahabad.
6. Sharma, P.D. (2017). Ecology and Environment. Rastogi publishers, New Delhi.
7. Kaushik, C.P. and Kaushik A. (2011). Perspectives in environmental studies. New age International (P) Limited, Publishers, New Delhi.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-III
STAT-201: Statistical Methods

Max Marks: 100
Theory: 36 marks

Internal Assessment: 14 marks
Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

Section-A

1. Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data.
2. Measures of Central Tendency & Dispersion.
3. Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions.
4. Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation.

Section-B

5. Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means.
6. Chi-Square Test of Independence of Attributes in 2×2 Contingency Table.
7. Introduction to Analysis of Variance, Analysis of One Way Classification.
8. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Graphical Representation of Data.
2. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles.
3. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data).

PUNJABI UNIVERSITY, PATIALA

Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

4. Measures of Dispersion (Grouped Data). Moments, Measures of Skewness& Kurtosis (Ungrouped Data). Moments, Measures of Skewness& Kurtosis (Grouped Data).
5. Correlation & Regression Analysis.
6. Application of One Sample t-test. Application of Two Sample Fisher's t test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2×2 contingency table.
7. Analysis of Variance One Way Classification.
8. Analysis of Variance Two Way Classification.
9. Selection of random sample using Simple Random Sampling.

Recommended books:

1. Gupta, S. P. (1976). Statistical Methods India: Sultan Chand & Sons.
2. Arāṅkacāmi, I., Rangaswamy, R. (1995). A Text Book of Agricultural Statistics. India: New Age International Publishers.
3. Statistics for Economics. (n.d.). (n.p.): New Saraswati House India Pvt Ltd.
4. Gupta, S. C., Kapoor, V. K. (2007). Fundamentals of Applied Statistics. India: Sultan Chand & Sons.
5. Abraham, B., Ledolter, J. (2009). Statistical Methods for Forecasting. Germany: Wiley.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-III
LPM-201 : Livestock & Poultry Management

Max Marks: 200
Theory: 110 marks

Internal Assessment: 40 marks
Practical: 50 marks

THEORY

Teaching: 3 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 16 marks each. Section C will consist of 23 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 46 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

SECTION A

1. Role of livestock in the national economy. Reproduction in farm animals and poultry.
2. Housing principles, space requirements for different species of livestock and poultry.
3. Management of calves, growing heifers and milch animals.
4. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

SECTION B

5. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.
6. Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions.
7. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.
8. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. External body parts of cattle, buffalo, sheep, goat, swine and poultry.
2. Handling and restraining of livestock.
3. Identification methods of farm animals and poultry.
4. Visit to IDF and IPF to studybreeds of livestock and poultry and daily routine farm operations and farm records.
5. Judging of cattle, buffalo and poultry.
6. Culling of livestock and poultry.
7. Planning and layout of housing for different types of livestock.
8. Computation of rations for livestock. Formulation of concentrate mixtures.
9. Clean milk production, milking methods.
10. Hatchery operations, incubation and hatching equipments.
11. Management of chicks, growers and layers. Debeaking, dusting and vaccination.
12. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

Recommended books:

1. Bundy, C. E., & Diggins, R. V. (1961). Livestock and poultry production. *Livestock and poultry production.*, (2nd ed).
2. Singh, H Handbook of Animal Husbandary, ICAR, New Delhi
3. Singh H and E.N. Moore (1982). Livestock and Poultry Production , Prentice Hall of India
4. Etgen, W. M., & Reaves, P. M. (1978). *Dairy cattle feeding and management* (No. Ed. 6). John Wiley & Sons..
5. Miller, W. J. (2012). *Dairy cattle feeding and nutrition*. Elsevier.
6. Banerjee, G. C. (2018). *A textbook of animal husbandry*. Oxford and IBH publishing.
7. Prasad, J. (2008). *Poultry production and management*. Kalyani.
8. Singh, R. A. (2018). *Poultry Production*. India: Kalyani Publishers.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

B.Sc. (Hons. in Agriculture) Semester-IV

COURSE CODE	SUBJECT	THEORY		PRACTICAL	TOTAL
		EXTERNAL	INTERNAL		
AGRON-202	Crop Production Technology –II (Rabi Crops)	36	14 ^a	50	100
HORT-202	Production Technology for Ornamental Crops, MAP and Landscaping	36	14 ^a	50	100
AGRI-ENG-202	Renewable Energy and Green Technology	36	14 ^a	50	100
SOIL-201	Problematic Soils and their Management	74	26 ^c	-	100
HORT-203	Production Technology for Fruit and Plantation Crops	36	14 ^a	50	100
GPB-202	Principles of Seed Technology	36	14 ^a	100	150
AGRON-203	Farming System & Sustainable Agriculture	36	14 ^a	-	50
ECO-202	Agricultural Marketing Trade & Prices	74	26 ^c	50	150
AGROMET-201	Introductory Agro-meteorology & Climate Change	36	14 ^a	50	100
Elective Course (Choose any one)					
HORT-204	Hi-Tech Horticulture	74	26 ^c	50	150
ENT-201	Biopesticides & Biofertilizers	74	26 ^c	50	150
FOOD-TEC-201	Food Safety and Standards	74	26 ^c	50	150
	Total	474	176	450	1100

The breakup of marks for the internal assessment for theory (According to RUSA guidelines) will be as under:

Average of two mid-semester tests/Internal Examinations	: a/6/ b10/ c10/ d/16
Written Assignments/Project Work	: a/6/ b10/ c10/ d/16
Attendance	: a/2/ b5/ c6/ d8

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV

AGRON-202 : Crop Production Technology-II (Rabi crops)

Max Marks: 100

Theory: 36 marks

Internal Assessment: 14 marks

Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

Section-A

1. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of crops, cereals –wheat and barley
2. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of crops pulses-chickpea, lentil, peas
3. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of crops, oilseeds-rape seed, mustard and sunflower
4. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of crops, potato.

Section-B

5. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of crops, sugar crops-sugarcane, sugarbeet
6. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of crops medicinal and aromatic crops-mentha, lemon grass and citronella.
7. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of crops Forage crops-berseem, lucerne and oat.
8. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of crops, tobacco.

PRACTICAL

Max. Marks: 50

Pass Marks: 40%

Time allowed: 3 Hours

Teaching: 2 hrs per week

1. Sowing methods of wheat and sugarcane
2. Identification of weeds in *rabi* season crops,
3. Study of morphological characteristics of *rabi* crops,

PUNJABI UNIVERSITY, PATIALA

Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

4. Study of yield contributing characters of *rabi* season crops,
5. Yield and juice quality analysis of sugarcane,
6. Study of important agronomic experiments of *rabi* crops at experimental farms.
7. Study of *rabi* forage experiments,
8. Study of oil extraction of medicinal crops,
9. Visit to research stations of related crops.

Recommended Books

1. Prasad R. (2002). Textbook of field crops production. Textbook of field crops production.
2. Reddy T. Yellamanda and Reddy, G.H. Sankara. (2016). Principles of Agronomy (2nd ed), Kalyani Publishers, Ludhiana.
3. Gupta OP. (2005) Weed Management: Principles and Practices (2nd ed) Agrobios (India) Jodhpur.
4. Singh C., Singh P. and Singh R. (2003). Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
5. Singh SS. (1998). Crop Management: Under irrigated and rainfed conditions.
6. Singh SS. (1993). Principles and Practices of Agronomy, Kalyani Publishers, New Delhi.
7. Reddy TY. and Reddi, GHS. (1993). Principles of Agronomy, Kalyani Publishers, New Delhi..
8. Maiti,S., Hedge, MR. and Chhattopadhyay SB. (1988). Handbook of Annual Oilseed Crops. Oxford & IBH Publishing Co., New Delhi.
9. Jaiswami LH. and Baldeo B. (1990). Advances in Pulse Production Technology, ICAR, New Delhi.
10. Rathore PS. (2000). Techniques and Management of Field Crop Production. Agrobios (India), Jodhpur.
11. Rathor, PS. and Sharma SK. (2003). Scientific Pulse Production. Yash Publishing House, Bikaner.
12. Reddy SR. Agronomy of Field Crops. Kalyani Publishers, New Delhi.
13. Prasad R. Field crops Vol.I & II. ICAR, New Delhi.
14. Ray S, (2007). editor. Handbook of agriculture in India. New Delhi: Oxford University Press;
15. Pearson : Handbook of Agriculture ICAR, New Delhi.
16. Fugh BM : Production of field Crops in India, Kitabistan, Allahabad
17. Harlison CM : Field Crops, Mc Graw Hill Book Co., New Delhi.
18. P.A.U Bulletin: Package of Practices for Kharif Crops.

Sem-IV

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

HORT-202: Production Technology for Ornamental Crops, MAPs and Landscaping

Max Marks: 100
Theory: 36 marks

Internal Assessment: 14 marks
Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

Section A

1. Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping.
2. Principles of landscaping. Landscape uses of trees, shrubs and climbers.
3. Production technology of important cut flowers like Rose, Gerbera, Carnation, Lilium and Orchids under protected conditions
4. Production technology of important cut flowers like Gladiolus, Tuberose, Chrysanthemum under open conditions.

Section B

5. Package of practices for loose flowers like Marigold and Jasmine under open conditions.
6. Production technology of important medicinal plants like Ashwagandha, Asparagus, Aloe, Costus, Cinnamomum, Periwinkle, Isabgol
7. Production technology of important aromatic plants like Mint, Lemongrass, Citronella, Palmarosa, Ocimum, Rose, Geranium, Vetiver.
8. Processing and value addition in ornamental crops and MAPs produce.

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Identification of Ornamental plants.
2. Identification of Medicinal and Aromatic Plants.
3. Nursery bed preparation and seed sowing.
4. Training and pruning of Ornamental plants.
5. Planning and layout of garden.
6. Bed preparation and planting of MAP.
7. Protected structures – care and maintenance.
8. Intercultural operations in flowers and MAP.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

9. Harvesting and post-harvest handling of cut and loose flowers.
10. Processing of MAP.
11. Visit to commercial flower/MAP unit.

Recommended Books

1. Arora, J. S. (2020). Introductory Ornamental Horticulture. India: Kalyani Publishers.
2. Desh Raj. (2008). Floriculture AtGlance.India: Kalyani Publishers.
3. Bose, T. K. (2002). Commercial Flowers (vol.2) (sec.Rev.Edn.). India: NayaProkash.
4. Pal, B. P. (1966). The Rose in India. India: Indian Council of Agricultural Research.
5. Handbook Of Horticulture. (2001). India: Indian Council Of Agricultural Research,N Delhi. ICAR
6. Pruthi, J. S. (2011). Spices and Condiments. India: National Book Trust.
7. Srivastava, H. C. (2014). Medicinal and Aromatic Plants. India: Directorate of Knowledge Management in Agriculture, Indian Council of Agricultural Research.
8. Chadha , K. L. and B. Choudhary. (1986).Ornamental Horticulture in India. India: Indian Council of Agricultural Research.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV

AGRI-ENG-202: Renewable Energy and Green Technology

Max Marks: 100

Theory: 36 marks

Internal Assessment: 14 marks

Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

Section A

1. Classification of energy sources, contribution of these of sources in agricultural sector.
2. Familiarization with biomass utilization for bio fuel production and their application.
3. Familiarization with types of biogas plants and gasifiers.
4. Familiarization with biogas, bio-alcohol, biodiesel and bio-oil production and their utilization as bio energy resource.

Section B

5. Introduction of solar energy, collection and their application.
6. Familiarization with solar energy gadgets: solar cooker, solar water heater.
7. Applications of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application.
8. Introduction of wind energy and their application.

PRACTICAL

Max. Marks: 50

Pass Marks: 40%

Time allowed: 3 Hours

Teaching: 2 hrs per week

1. Familiarization with renewable energy gadgets.
2. To study biogas plants.
3. To study gasifier.
4. To study the production process of biodiesel.
5. To study briquetting machine.
6. To study the production process of bio-fuels.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

7. Familiarization with different solar energy gadgets.
8. To study solar photovoltaic system: solar light, solar pumping, solar fencing.
9. To study solar cooker.
10. To study solar drying system, solar distillation and solar pond.

Recommended Books:

1. Sharma, P.D. (2017). Ecology and Environment. Rastogi publishers, New Delhi.
2. Kaushik, C.P. and Kaushik A. (2011). Perspectives in environmental studies. New age International (P) Limited, Publishers, New Delhi.
3. Twidell, J and Weir T (2015) Renewable Energy Resources, Routledge publishers..

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV
SOIL-201: Problematic Soils and their Management

Max Marks: 100
Theory: 74 marks

Internal Assessment: 26 marks

THEORY

Teaching: 2 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 11 marks each. Section C will consist of 15 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each from section A and B and the entire section C.

THEORY

Teaching: 2 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

Section A

1. Soil quality and health, their importance, assessment and management.
2. Distribution of Waste land and problem soils in India. Their categorization based on properties.
3. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils,
4. Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture.

Section B

5. Remote sensing and GIS in diagnosis and management of problem soils.
6. Multipurpose tree species, bio remediation through MPTs of soils,
7. land capability and classification, land suitability classification.
8. Problematic soils under different Agro-ecosystems.

Recommended Books:

1. Brady, N. C., Weil, R. R. (2014). The Nature and Properties of Soils. United Kingdom: Pearson.
2. Nelson, W. L., Tisdale, S. L. (1970). Soil Fertility and Fertilizers. India: Macmillan.
3. Soil Conditions and Plant Growth. (2012). Germany: Wiley.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

4. Conklin, A. R. (2005). Introduction to Soil Chemistry: Analysis and Instrumentation. Germany: Wiley.
5. Subba, R. (2017). Soil Microbiology. India: CBS Publishers & Distributors.
6. Tate, R. L. (2020). Soil Microbiology. United Kingdom: Wiley.
7. Diagnosis and Improvement of Saline and Alkali Soils. (1954). United States: U.S. Government Printing Office.
8. Soil Fertility: Theory and Practice. (1976). India: Indian Council of Agricultural Research.
9. Sehgal, J. (2018). Textbook of Pedology: Concepts and Applications. India: Kalyani Publishers.
10. Das, D. K. (2008). Introductory Soil Science. India: Kalyani Publishers.
11. Biswas, T. D., Mukherjee, S. (2001). Textbook of Soil Sciences. India: McGraw-Hill Education.
12. Handbook of Soil Sciences (Two Volume Set). (2018). United Kingdom: CRC Press.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV
HORT-203 : Production Technology for Fruit and Plantation Crops

Max Marks: 100
Theory: 36 marks

Internal Assessment: 14 marks
Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

Section- A

1. Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks.
2. Production technologies for the cultivation of major crops -mango, banana, citrus, banana.
3. Production technologies for the cultivation of major crops- grape, guava, litchi, papaya Sapota.
4. Production technologies for the cultivation of major crops- apple, pear, peach, walnut, almond

Section- B

5. Production technologies for the cultivation of minor crops -date, ber, pineapple
6. Production technologies for the cultivation of minor crops- pomegranate, jackfruit, strawberry
7. Production technologies for the cultivation of plantation crops- coconut, arecanut, cashew
8. Production technologies for the cultivation of plantation crops- tea, coffee & rubber.

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Seed propagation
2. Scarification and stratification of seeds.
3. Propagation methods for fruit and plantation crops.
4. Description and identification of fruit.
5. Preparation of plant bio regulators and their uses.
6. Important pests and diseases of fruit crops.
7. Important physiological disorders of fruit crops.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

8. Important pests and diseases of plantation crops.
9. Important physiological disorders of plantation crops
10. Visit to commercial orchards.

Recommended Books:

1. Bal, J. S. (2008). Fruit Growing. India: Kalyani Publishers.
2. Basic Horticulture. (2008). India: Kalyani Publishers.
3. Peter, K. V. (2009). Basics Of Horticulture. India: New India Publishing Agency.
4. Package and practices for fruit crops published by PAU Ludhiana
5. Hu, C. (2019). Fruit Crops: Diagnosis and Management of Nutrient Constraints. Netherlands: Elsevier Science.
6. Radha, T., Mathew, L. (2007). Fruit Crops. India: New India Publishing Agency.
7. Looney, N. E., Morley-Bunker, M., Thiele, G., Jackson, D. (2011). Temperate and Subtropical Fruit Production. United Kingdom: CABI.
8. Chadha, T. R. (2001). Textbook of Temperate Fruits. India: Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research.
9. Chattopadhyay, T. K. (2001). A Textbook Of Pomology- Vol. IV, Temperate Fruits. Kalyani Publishers.
10. Chattopadhyay, T. K. (2001). Textbook of Pomology: Tropical Fruits. VII. India: Kalyani Publishers.
11. Chattopadhyay, T. K. (2001). A Textbook Of Pomology- Vol. III Subtropical Fruits. India: Kalyani Publishers.
12. Chadha, K.L. (2001). Handbook of Horticulture. . India: Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV

GPB-202 : Principles of Seed Technology

Max Marks: 150
Theory: 36 marks

Internal Assessment: 14 marks
Practical: 100 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

Section A

1. Seed and seed technology: introduction, definition and importance.
2. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production,
3. Seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important **cereals, pulses, oilseeds, fodder and vegetables**.
4. Seed certification, phases of certification, procedure for seed certification, field inspection, Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983,

Section B

5. Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test.
6. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.
7. Seed drying, processing and their steps, Seed testing for quality assessment, Seed treatment, its importance, method of application and seed packing; Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.
8. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 100 Pass Marks: 40% Time allowed: 3 Hours Teaching: 3 hrs per week

1. Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi.
2. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea.
3. Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard.
4. Seed production in important vegetable crops.
5. Seed sampling and testing: Physical purity, germination, viability, etc.
6. Seed and seedling vigour test.
7. Genetic purity test: Grow out test and electrophoresis.
8. Seed certification: Procedure, Field inspection, Preparation of field inspection report.
9. Visit to seed production farms, seed testing laboratories and seed processing plant.

Recommended Books:

1. Deesai BB, Katecha PM & Salunkhe DK. (1997). Seed Handbook: Biology, Production, Processing and Storage;
2. Marcel Dekker. Kelly A. (1988). Seed Production of Agricultural Crops;
3. Longman. McDonald MB Jr. & Copeland LO. (1988). Seed Production: Principles and Practices;
4. Chapman & Hall. Thompson JR. (1979) An Introduction to Seed Technology. Leonard Hill.
5. Kulkarni GN. (2002). Principles of seed technology. Kalyani Publishers;
6. Agrawal RL. (1998). Fundamentals of plant breeding and hybrid seed production. Science Publishers, Inc.;
7. Basra AS. (2007) Handbook of seed science and technology. Scientific Publishers.;
8. Copeland LO, McDonald MF. (2012) Principles of seed science and technology. Springer Science & Business Media.;
9. Chopra VL. (2001). Breeding field crops. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
10. Breeding Field Crops. New Delhi

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV

AGRON-203 : Farming System and Sustainable Agriculture

Max Marks: 50

Internal Assessment: 14 marks

Theory: 36 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

Section A

1. Farming System-scope, importance and concept. Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance
2. Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance
3. Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture
4. Indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability

Section B

1. Integrated farming system-historical background, objectives and characteristics
2. components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones
3. resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment
4. Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field

Recommended Books

1. Reddy, S.R. (2016). Farming System and Sustainable Agriculture. Kalyani Publishers
2. Nanwal, R.K. (2019). Farming System and Sustainable Agriculture. New India Publishing Agency
3. Walia, S. S.&Walia, U. S. (2020). Farming System and Sustainable Agriculture. Scientific Publishers.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV
ECO-202 : Agricultural Marketing, Trade and Prices

Max Marks: 150
Theory: 74marks

Internal Assessment: 26 marks
Practical: 50 marks

THEORY

Teaching: 2hrs per week Pass Marks: 40% Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 11 marks each. Section C will consist of 15 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each from section A and B and the entire section C.

Section-A

1. Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets.
2. Demand, supply and producer's surplus of Agri-commodities: nature and determinants of demand and supply of farm products.
3. Producer's Surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of Agri-commodities; product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies.
4. Pricing Considerations and Approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits.

Section-B

5. Marketing Process and Functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark).
6. Public Sector Institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;
7. Risk in Marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy;
8. Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Plotting and study of demand and supply curves and calculation of elasticities.
2. Study of relationship between market arrivals and prices of some selected commodities.
3. Computation of marketable and marketed surplus of important commodities.
4. Study of price behaviour overtime for some selected commodities.
5. Construction of index numbers.
6. Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class.
7. Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning.
8. Application of principles of comparative advantage of international trade.

Recommended Books:

1. Acharya, S.S., Agricultural Production Marketing and Price Policy in India, Mittal Publications, New Delhi, 1988.
2. Marketing and Pricing of Milk and Dairy Products in the United State” by Kenneth W Bailey.
3. Agricultural Prices in a Changing Economy: an Empirical Study of Indian Agriculture” by MunishAlagh.
4. Towards Free Trade in Agriculture” by Kirit S Parikh and Günther Fischer.
5. Marketing Strategies and Performance of Agricultural Marketing Firms” by OmotayoAdegbuyi
6. Moore, J.R., S.S.Johl and A.M.Khusro, Indian Foodgrain Marketing, Prentice-Hall of India Private Limited, New Delhi, 1973, p.35.
7. Kohls, R.L. and J.N.Uhl., Marketing of Agricultural Products, Macmillan Publishing Co., Inc., New York, 1980, p.595.
8. Randhawa, B.S., A.S.Kahlon and J.S.Sahota, "Costs & Margins in Marketing of Live poultry in Gurdaspur District of Punjab", Agricultural Marketing, Vol.X, No.1, April, 1967, p.11.
9. Acharya, S.S., Agricultural Production Marketing and Price Policy in India, Mittal Publications, New Delhi, 1988.
10. Pawar, P.P., K.R.Waykar, B.K.Mali and S.S.Bhosale, Need of Shetkari Bazar for Marketing of Fruits and Vegetables in Maharashtra, Ind. Journal of Agri. Marketing, 15(3), Sept.-Dec., 2002, pp.53-54.
11. Atibudhi, H.N. and Binodini Sethi, Krushak Bazar: An Ideal Bazar: A Case Study in Orissa. Indian J. of Agri. Marketing, 15(3), Sept.-Dec. 2001, pp.35-40.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV

AGROMET-201: Introductory Agrometeorology & Climate Change

Max Marks: 100

Theory: 36 marks

Internal Assessment: 14 marks

Practical: 50 marks

THEORY

Teaching: 1 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 6 marks each. Section C will consist of 6 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 12 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each section A and B and the entire section C.

Section-A

1. Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure
2. Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze
3. Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth
4. Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud

Section-B

5. Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture
6. Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave
7. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production
8. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Visit of Agro meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
2. Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law.
3. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
4. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
5. Measurement of soil temperature and computation of soil heat flux.
6. Determination of vapor pressure and relative humidity.
7. Determination of dew point temperature.
8. Measurement of atmospheric pressure and analysis of atmospheric conditions.
9. Measurement of wind speed and wind direction, preparation of wind rose.
10. Measurement, tabulation and analysis of rain.
11. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Recommend books:

1. Agricultural Meteorology- G. S. L. H. V. Prasada Rao
2. Agrometeorology -H. S. Mavi
3. Agrometeorology and Remote Sensing: Principles and Practices- D.D. Sahu
4. Fundamentals of Agrometeorology (2014) G.S. Mahi & P.K. Kingra

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV

HORT-204 : Hi-tech. Horticulture

Max Marks: 150
Theory: 74 marks

Internal Assessment: 26 marks
Practical: 50 marks

THEORY

Teaching: 2 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 11 marks each. Section C will consist of 15 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each from section A and B and the entire section C.

SECTION A

1. Introduction and importance; Nursery management and mechanization;
2. Micro propagation of horticultural crops; Modern field preparation and planting methods.
3. Protected cultivation: advantages, controlled conditions, method and techniques.
4. Micro irrigation systems and its components; EC, pH based fertilizer .

SECTION B

5. Canopy management, high density planting.
6. Components of precision farming: Remote sensing, Geographical Information System (GIS).
7. Differential Geo – positioning system (DGPS) and Variable Rate applicator (VRA).
8. Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Types of polyhouses and shade net houses,
2. Intercultural operations used in protected cultivation.
3. Tools and equipments identification. and application.of Micro propagation.
4. Nursery-protrays, micro-irrigation,
5. EC, pH basedfertilizer scheduling, canopy management,
6. visit to hi-tech orchard/nursery.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Recommend books:

1. Peter, K. V. (2013). Protected Cultivation of Horticultural Crops. India: NIPA.
2. Tyagi, S . (2019) Hi-Tech Horticulture: Volume 6: Advance Techniques. New India Publishing Agency.
3. Singh, D. K. (2004). Hi-tech Horticulture. India: Agrotech Publishing Academy.
4. Singh, B. (2015). Advances in Protected Cultivation. New India Publishing Agency.
5. Stanghellini, C., Van't Ooster, B., Heuvelink, E. (2019). Greenhouse Horticulture: Technology for Optimal Crop Production. Netherlands: Wageningen Academic Publishers.
6. SRINIVASAN A. (2006). Handbook of Precision Agriculture: Principles and Applications. United States: CRC Press.
7. Singh J. (2013). Precision Farming in Horticulture. New India Publishing Agency.
8. Ram, T. & L. S. K. & S. (2014). Precision Farming A New Approach. India: Daya Publishing House.
9. Precision Agriculture for Sustainability and Environmental Protection. (2013). United Kingdom: Taylor & Francis.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

Sem-IV

ENT-201: Bio-pesticides & Bio-fertilizers

Max Marks: 150
Theory: 74 marks

Internal Assessment: 26 marks
Practical: 50 marks

THEORY

Teaching: 2 hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 11 marks each. Section C will consist of 15 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each from section A and B and the entire section C.

Section A

1. History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales.
2. Botanicals and their uses. Mass production technology of biopesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides.
3. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.
4. Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers, *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*; Cynobacterial biofertilizers, *Anabaena*, *Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza.

Section B

5. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.
6. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers.
7. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc.
8. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus, Metarhizium* etc. and its production.
2. Identification of important botanicals.
3. Visit to biopesticide laboratory in nearby area.
4. Field visit to explore naturally infected cadavers.
5. Identification of entomopathogenic entities in field condition.
6. Quality control of biopesticides. I
7. Isolation and purification of *Azospirillum* , *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria.
8. Mass multiplication and inoculums production of biofertilizers.
9. Isolation of AM fungi -Wet sieving method and sucrose gradient method.
10. Mass production of AM inoculants.

Recommend books:

1. Deshmukh, A. M. (1998). Biofertilizers and Biopesticides. India: Technoscience Publications.
2. Kaushik B.D. Kumar D. & Shamim Md. (2019). Biofertilizers and Biopesticides in Sustainable Agriculture. United States: Apple Academic Press.
3. Rai, M. K. (2006). Handbook of Microbial Biofertilizers. United Kingdom: Taylor & Francis.
4. Verma, A *et al.*. (2019). Biofertilizers for Sustainable Agriculture and Environment. Germany: Springer International Publishing.
5. Brady, N. C., Weil, R. R. (2014). The Nature and Properties of Soils. United Kingdom: Pearson.
6. Nelson, W. L., Tisdale, S. L. (1970). Soil Fertility and Fertilizers. India: Macmillan.
7. Soil Conditions and Plant Growth. (2012). Germany: Wiley.
8. Conklin, A. R. (2005). Introduction to Soil Chemistry: Analysis and Instrumentation. Germany: Wiley.
9. Subba, R. (2017). Soil Microbiology. India: CBS Publishers & Distributors.
10. Tate, R. L. (2020). Soil Microbiology. United Kingdom: Wiley.
11. Diagnosis and Improvement of Saline and Alkali Soils. (1954). United States: U.S. Government Printing Office.
12. Soil Fertility: Theory and Practice. (1976). India: Indian Council of Agricultural Research.
13. Sehgal, J. (2018). Textbook of Pedology: Concepts and Applications. India: Kalyani Publishers.
14. Das, D. K. (2008). Introductory Soil Science. India: Kalyani Publishers.
15. Biswas, T. D., Mukherjee, S. (2001). Textbook of Soil Sciences. India: McGraw-Hill Education.
16. Handbook of Soil Sciences (Two Volume Set). (2018). United Kingdom: CRC Press.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

SEM-IV

FOOD-TEC-201: Food Safety and Standards

Max Marks: 150

Theory: 74 marks

Internal Assessment: 26 marks

Practical: 50 marks

THEORY

Teaching: 2hrs per week

Pass Marks: 40%

Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and will carry 11 marks each. Section C will consist of 15 short-answer type questions of 2 marks each which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR CANDIDATES

The Candidates are required to attempt two questions from each from section A and B and the entire section C.

Section-A

1. Food Safety – Definition, Importance, Scope and Factors affecting Food Safety.
2. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage.
3. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.
4. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series.

Section-B

5. TQM concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.
6. Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food.
7. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling.
8. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

PUNJABI UNIVERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B.Sc.(Hons. in Agriculture) Part II
(Semester III & IV) Session 2021-2022, 2022-23 and 2023-2024

PRACTICAL

Max. Marks: 50 Pass Marks: 40% Time allowed: 3 Hours Teaching: 2 hrs per week

1. Water quality analysis physico-chemical and microbiological.
2. Preparation of different types of media.
3. Microbiological Examination of different food samples.
4. Assessment of surface sanitation by swab/rinse method.
5. Assessment of personal hygiene.
6. Biochemical tests for identification of bacteria.
7. Scheme for the detection of food borne pathogens.
8. Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.

Recommend books:

1. Food Safety Handbook: A Practical Guide for Building a Robust Food Safety Management System. (2020). United States: World Bank Publications.
2. Srilakshmi, B. (2007). Food Science. India: New Age International (P) Limited.
3. Hotchkiss, J. H., Potter, N. N. (2012). Food Science: Fifth Edition. United States: Springer US.
4. Shakuntala Manay. (2001). Food: Facts And Principles. New Age.
5. <https://ncert.nic.in/textbook/pdf/lehe106.pdf>.
6. Mondal, S. (2019). Food Safety and Human Health. United Kingdom: Elsevier Science.
7. Lásztity, R. (2009). Food Quality and Standards. United Kingdom: EOLSS Publishers Company Limited.