PUNJABI UNN ERSITY, PATIALA
Scheme of Studies & Examination and Syllabus for B. Sc.(Hon's in Agriculture)
Part-I (Sem. I & II) Session 2021-22, 2022-2023 & 2023-24

AGRB4PUP

COURSE CODE	SUBJECT	THEORY		PRACTICAL	TOTAL
		EXTERNAL	INTERNAL		
AGRB1101C	Fundamentals of Horticulture	36	14[a]	50	100
AGRB1102C	Fundamentals of Plant Biochemistry and Biotechnology	74	26[c]	50	150
AGRB1103C	Fundamentals of Soil Science	74	26[c]	50	150
AGRB1104C	Introduction to Forestry	36	14[a]	50	100
AGRB1105C	Comprehension & Communication Skills in English	36	14[a]	50	100
AGRB1106C	Fundamentals of Agronomy	110	40[d]	50	200
AGRB1107T	Rural Sociology & Educational Psychology	74	26[c]		100
REMEDIAL COURSE					
AGRB1108C	Introductory Biology (For Non-Medical Students)	36	14[a]	50	100
AGRB1109T	Elementary Mathematics (For Medical Students)	74	26[c]	-	
AGRB1110T	Agricultural Heritage	36	14[a]	-	50
QUALIFYING COURSE					
AGRB1111T	Punjabi (For Professional * Courses)/Punjabi Mudla Gyan/Elementory Punjabi (For Students of other State) **(Qualifying Paper)**	75	25[b]	-	100
NON-REMEDIAL COURSE					
AGRB1112T	Human Values & Ethics	36	14[c]	-	50 (Qualifying)
AGRB1113L	NSS/NCC/ Physical Education & Yoga Practices	-	-	**50**	
TOTAL					**1050**

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/ [b]10/ [c]10/ [d]/16
Written Assignments/Project Work : [a]6/ [b]10/ [c]10/ [d]/16
Attendance : [a]2/ [b]5/ [c]6/ [d]8

***If the student not qualify the Subject Professional Punjabi in Part-I (Sem. I & II) then he/she qualify this subject in Part-II (Sem. III & IV) or Part-III (Sem. V & VI).**

Scheme of StudiesSemester-II

COURSE CODE	SUBJECT	THEORY		PRACTICAL	TOTAL
		EXTERNAL	INTERNAL		
AGRB1201C	Fundamentals of Genetics	74	26[c]	50	150
AGRB1202C	Agricultural Microbiology	36	14[a]	50	100
AGRB1203C	Soil and Water Conservation Engineering	36	14[a]	50	100
AGRB1204C	Fundamentals of Crop Physiology	36	14[a]	50	100
AGRB1205T	Fundamentals of Agricultural Economics	74	26[c]	-	100
AGRB1206C	Fundamentals of Plant Pathology	110	40[d]	50	200
AGRB1207C	Fundamentals of Entomology	110	40[d]	50	200
AGRB1208C	Fundamentals of Agricultural Extension Education	74	26[c]	50	150
AGRB1209C	Communication Skills and Personality Development	36	14[a]	50	100
QUALIFYING SUBJECT					
AGRB1210T	Punjabi (For Professional Courses)/Punjabi Mudla Gyan/Elementary Punjabi (For Students of Other State)	75	25[b]	-	100 (Qualifying)
AGRB1211T	Drug Abuse; Problem Management & Prevention	75	25[b]	-	100 (Qualifying)
	Total				**1200**

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/ [b]10/ [c]10/ [d]/16
Written Assignments/Project Work : [a]6/ [b]10/ [c]10/ [d]/16
Attendance : [a]2/ [b]5/ [c]6/ [d]8

Syllabus for B. Sc.(Hon's in Agriculture) Part-1 (Sem. I & II)
Session 2021-22, 2022-2023 & 2023-24

Sem-I

AGRB1101C : FUNDAMENTALS OF HORTICULTURE

Max Marks: 100 **Internal Assessment: 14 marks**
Theory: 36 marks **Practical: 50 marks**

THEORY

Teaching: 1 hr 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 8 short answer type questions of 1.5 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. Horticulture-Its definition and branches, importance and scope. Horticultural and botanical classification; climate and soil for horticultural crops.
2. Plant propagation-methods and propagating structures; Seed dormancy, Seed germination.
3. Principles and methods of training and pruning of important horticulture plants.
4. Pollination, pollinizers and pollinators; fertilization and parthenocarpy.

Section B

5. Juvenility and flower bud differentiation, unfruitfulness
6. Principles of orchard establishment, planning and laying out of orchards
7. Importance of plant bio-regulators in horticulture. Irrigation - methods, Fertilizer application in horticultural crops.
8. Medicinal and aromatic plants: Introduction, names, families, importance, and areas of cultivation of important plants

PRACTICAL

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

1. Identification of garden tools.
2. Identification of horticultural crops.
3. Preparation of seed bed/nursery bed.
4. Practice of sexual and asexual methods of propagation including micro-propagation.
5. Layout and planting of orchard plants.
6. Training and pruning of fruit trees
7. Preparation of potting mixture.
8. Fertilizer application in different crops.
9. Visits to commercial nurseries/orchard.

Recommended Books

1. Adams, C.R. and M. P. Early. 2004. Principles of horticulture. Butterworth- Heinemam, Oxford University Press.
2. Bansil, P.C. 2008. Horticulture in India. CBS Publishers and Distributors, New Delhi.
3. Bhattachaijee.S.K. 2006. Amenity Horticulture, Biotechnology and Post harvest technology. Pointer publishers. Jaipur
4. Chadha, K.L. 2001, Handbook of Horticulture, ICAR, New Delhi.
5. Chandra, R. and M. Mishra. 2003. Micropropagaiton of horticultural crops. InternationalBook Distributing Co., Lucknow.
6. Christopher, E.P. 2001. Introductory Horticulture, Biotech Books, New Delhi
7. Edmond, J.B. T.L.Senn, F.S. Andrews and P.O. Halfacre, 1975. Fundamentals of Horticulture, Tata MC. Graw Hill Publishing Co. New Delhi
8. George Acquaah, 2002, Horticulture-principles and practices. Prentice-Half of India pvt. Ltd., New Delhi.
9. Azhar Ali Farooqui and Sreeramu, B.S. 2001. Cultivation of medicinal and aromatic plants. United Press Limited.
10. Atal, E.K. and Kapur, B. 1982. Cultivation and Utilization of Medicinal and Aromatic plants New Delhi.

Sem-I

AGRB1102C: FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY

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 1S 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. Importance of Biochemistry, Properties of Water; pH, Buffers and their importance.
2. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and Zwitter ions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line-Weaver Burk equation & plots; Introduction to allosteric enzymes.
3. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure.
4. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Section B

S. Concepts and appl ications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications.
6. Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance.
7. Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; Cryo-preservation; Introduction to recombinant.
8. DNA transfer methods: physical (Gene gun method), chemical (PEG med iated) and *Agrobacterium* mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RA.PD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

PRACTICAL

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

1. Preparation of solution & buffers, pH determination.
2. Qualitative tests of carbohydrates and amino acids.
3. Quantitative estimation of glucose/ proteins.
4. Titration methods for estimation of amino acids/lipids
S. Paper chromatographyffLC demonstration for separation of amino acids /Monosaccharides.
6. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants.
7. Micro-propagation, hardening and acclimatization.
8. Demonstration on isolation of DNA.
9. Demonstration of gel electrophoresis techniques and DNA finger printing.

Sem-1

AGRB1102C: FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY

Recommended Books

1. Berg, J.M., Tymoczko, J.C. and Stryer, L. (2002). Biochemistry. W.H. Freeman & Co., New York.
2. Conn, E.C., Stumpf, P.K., Bruening, G and Doi, R.H. (2005). Outlines of Biochemistry. John Wiley & Sons (Asia) Pvt. Ltd., Singapore
3. Jain, J.L. (2000) Fundamentals of Biochemistry Chand & Co., New Delhi.
4. Moran, L.A., Horton, R.A., Scrimgeour, G. and Perry, M. (2012). Principles of Biochemistry 5th edition, Pearson Prentice Hall.
5. Nelson, D.L. and Cox, M.M. (2006) Lehingers Principles of Biochemistry. W.H. Freeman & Co., New York.
6. Powar, C.B. and Chatwal, G.R. (1986). Biochemistry. Himalaya Publishing House, New Delhi.
7. Rao, K.R. (1986). Text book of biochemistry.
8. Brown T A. 2002. *Genomes 2*. 2nd ed. New york:Wiley-Liss.
9. Prave P, Faust U, Sittig W & Sukatsch DA. 1987. *Basic Biotechnology: A Student's Guide*. VCH Verlagsgesellschaft.
10. Renneberg R. 2008. *Biotechnology for Beginners*. Academic Press Publishers.
11. Singh, B. D. Plant Biotechnology
12. Chawla H.S. Introduction to Plant Biotechnology, Oxford & IBH, New Delhi.

Sem-I

AGRB1103C : FUNDAMENTALS OF SOIL SCIENCE

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. Soil as a natural body, Pedological and edaphological concepts of soil
2. Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity;
3. Elementary knowledge of soil taxonomy classification and soils oflndia; Soil water retention, movement and availability.
4. Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability.

Section B

5. Soil colloids - inorganic and organic; silicate clays: constitution and properties; ources of charge; ion exchange, cation exchange capacity, base saturation.
6. Soil organic matter: composition, properties and its influence on soil properties; hurnic substances - nature and properties
7. Soil organisms: macro and micro organisms, their beneficial and harmful effects.
8. Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

PRACTICAL

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

1. Study of soil profile in field.
2. Study of soil sampling tools, collection of representative soil sample, its processing and storage.
3. Study of soil forming rocks and minerals.
4. Determination of soil density, moisture content and porosity.
5. Determination of soil texture by feel and Bouyoucos Methods.
6. Studies of capillary rise phenomenon of water in soil column and water movement in soil.
7. Determination of soil pH and electrical conductivity.
8. Determination of cation exchange capacity of soil.
9. Study of soil map.
10. Determination of soil colour.
11. Demonstration of heat transfer in soil.
12. Estimation of organic matter content of soil.

Recommended Books

1. A text book of Soil Science – T.D. Biswas& S.K. Mukherjee Tata McGraw-Hill Publishing Company.
2. Conception, Application of Pedology – J.L. Sehgal.
3. Fundamentals of Soil Science – Indian Society of Soil Science.
4. Fundamentals of Soil Science Wiley Eastern PVT LTD New Delhi, Roth HD and Turk L H.
5. Introduction to soil Physics –D. Hillel.
6. Manures and Fertilizer, Agri/ KA Publishing Co Nagpur, Yawalkar, KS Aggarwal, JP and Bakele S.
7. Soil Physics – B.P.Ghildyal and R.P.Tripathy.
8. Soil theory chemistry and Fertility in tropical Asia, Prentice hall of PVT LTD, New Delhi India Tenhane R.V. Motiramani, DP, Bali VP and Dohhahue Royl.
9. The Nature and properties of Soil Mcmillan publishing Co. New Delhi, Brady, Nylkse CC :
10. The nature and properties of soils-N.C.Brady and Ray R.Weil, Pearson Publications

Sem-I
AGRB1104C: INTRODUCTIONTO FORESTRY

Max Marks: 100 Internal Assessment: 14 marks
Theory: 36 marks Practical: 50 marks

THEORY

Teaching: 1 hr 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 8 short-answertype questions of 1.5 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 - definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies
2. Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, Natural and artificial methods of plant propagation.
3. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration - objectives, choice between natural and artificial regeneration, essential preliminary considerations
4. Crown classification. Tending operations - weeding, cleaning, thinning - mechanical, ordinary, crown and advance thinning

Section B

5. Forest mensuration - objectives , diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method.
6. Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.
7. Agroforestry - definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens.
8. Cultivation practices of two important fast growing tree species of the region.

PRACTICAL

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

I. Identification of tree-species
2. Diameter measurements using calipers and tape, diameter.
3. Measurements of forked, buttressed, fluted and leaning trees
4. Height measurement of standing trees by shadow method, single pole method and hypsometer
5. Volume measurement of logs using various formulae.
6. Nursery lay out, seed sowing, vegetative propagation techniques.
7. Forest plantations and their management. Visits of nearby forest based industries.

Recommended Books

1. Tejwani, K. G. Agroforestry In India
2. Bebarta, K. C. Forest Resources & Sustainable Development
3. Prabhu, S. Indian Forestry
4. Bebarta, K. C. Planning For Forest Resources And Bio Diversity Managment
5. Khana LS . Forest Mensuration International Book Distributors Dehradun Uttarakhand
6. Khanna L S. Principles and Practice Of Silviculture"
7. Manikandan & Prabh . Indian Forestry: A breakthrough approach to Forest Service"

PUNJABI UNIVERSITY PATIALA
Syllabus for B. Sc.(Hon's in Agriculture) Part-I (Sem. I & II)
Session 2021-22, 2022-2023 & 2023-24

Sem-1

AGRB1105C: COMPREHENSION & COMMUNICATION SKILLS IN ENGLISH

Max Marks: 100 **Internal Assessment: 14 marks**
Theory: 36 marks **Practical: 50 marks**

THEORY

Teaching: 1 hr 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 short-answertype questions of 1.5 mark 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 t e entire section C.

Section -A

I. Comprehension passage covering War Minus Shooting- The sporting Spirit, A Dilemma- A layman looks at science Raymond B. Fosdick and You and Your English - Spoken English and broken English G.B. Shaw.
2. Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words
3. Vocabulary based on TOEFL and other competitive examinations
4. Precise writing and Paragraph writing

Section B

5. Report writing and Proposal writing.
6. Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration
7. Curriculum Vitae and Job applications.
8. The Style: Importance of professional writing, Synopsis Writing and Interviews: kinds, Importance and process.

PRACTICAL

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

Practical examination will be conducted by the Examiner from the following topics:

l . Listening Comprehension : Listening to short talks lectures, speeches (scientific, commercial and general in nature.
2. Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness
3. Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills.
4. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability.
5. Group Discussions.

Sem-1

AGRB1105C: COMPREHENSION & COMMUNICATION SKILLS IN ENGLISH

Recommended books

1. Balasubramanian, T. 1989. A Text book of Phonetics for Indian Students. Orient Longman, New Delhi.
2. Balasubrmanyam, M. 1985. Business Communication. Vani Educational Books, New Delhi.
3. Naterop, Jean, B. and Rod Revell. 1997. Telephoning in English. Cambridge University Press, Cambridge.
4. Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd. New Delhi.
5. Krishnaswamy,. N and Sriraman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras.
6. Narayanaswamy V R. 1979. Strengthen your writing. Orient Longman, New Delhi.
7. Sharma R C and Krishna Mohan. 1978. Business Correspondence. Tata Mc Graw Hill publishing Company, New Delhi.
8. Carnegie, Dale. 2012. How to Win Friends and Influence People in the Digital Age. Simon & Schuster.
9. Covey Stephen R. 1989. The Seven Habits of Highly Successful People. Free Press.
10. Spitzberg B, Barge K & Morreale, Sherwyn P. 2006. Human Communication: Motivation, Knowledge & Skills. Wadsworth.
11. Verma, KC. 2013. The Art of Communication. Kalpaz.
12. Dr. T. Bharati, Dr. M. Hariprasad and Pro. V. Prakasam, Personality Development and Communicative English. Neelkamal Publications Pvt. Ltd, New Delhi.
13. Wren and Martin, S. Key to High School English Grammar and Composition- Chand and Company Ltd., New Delhi
14. Wren and Martin, S. High School English Grammar and Composition- Chand and Company Ltd., New Delhi
15. Raymond Murphy, English Grammar in Use. Cambridge University Press
16. The Official Guide to the TOEFL Test-IV Edition, Educational Testing Services. Mc Graw Hill, New Delhi.
17. KrishnaMohanand, MeeraBanerjee, 1990. DevelopingCommunicationSkills. MacmillanIndiaLtd.
18. Asha kaul , Business communication , prentice hall of india, New Delhi
19. N Sundarajan business communication , Sura college of competition, Chennai
20. Oxford current English Grammar and communication skills by Dr. Indrajit

Sem-I

AGRB1106C: FUNDAMENTALS OF AGRONOMY

Max Marks: 200 **Internal Assessment: 40 marks**
Theory: 110 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

I. Agronomy and its scope, seeds and sowing,
2. Tillage and tilth, crop density and geometry,
3. Crop nutrition, manures and fertilizers, nutrient use efficiency,
4. water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, logging.

Section B

5. Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy.
6. Growth and development of crops, factors affecting growth and development.
7. Plant ideotypes, crop rotation and its principles, adaptation and distribution of crops.
8. Crop management technologies in problematic areas, harvesting and threshing of crops.

PRACTICAL

Max. Marks: 50 **Pass Maries: 40%** **Time allowed: 3 Hours** **Teaching: 2 hrs perweek**

1. Identification of crops, seeds, fertilizers, pesticides and tillage implements.
2. Study of agro-climatic zones of India.
3. Identification of weeds in crops.
4. Methods of herbicide and fertilizer application.
5. Study of yield contributing characters and yield estimation.
6. Seed germination and viability test.
7. Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement.
8. Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill.
9. Study of soil moisture measuring devices.
10. Measurement of field capacity, bulk density and infiltratjon rate.
11. Measurement of irrigation water.

Sem-1
AGRB1106C: FUNDAMENTALS OF AGRONOMY

Recommended Books:

1. [ICAR. 20I 0. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
2. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (Indi,a) Jodhpur
3. Balasubramaniyan, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy (2nd editio n), Agrobios (India), Jodhpur
4. Reddy, T. Yellamanda and Reddy, G.H. Sankara. 2016. Principles of Agronomy (2nd edition) , Kalyani Publishers, Ludhiana
5. Reddy, S.R.20 12. Principles of Crop Production (4th edition), Kalyani Publishers, Ludhiana.
6. Gupta, O.P. 2005. Weed Management: Principles and Practices (2nd Ed) Agribios (India) Jodhpur.
7. De, Gopal Chandra 1989, Fundamentals of Agronomy. Oxford & IBH Publishing Cp., New-Delhi.
8. Michael, A.M. 1987. Irrigation - Theory and Practice, Vikas Publishing House Pvt. Ltd., New-Delhi.
9. Mishra, R.D. and Ahmed, M. 1987. Manual on Irrigation Agronomy, Oxford & lBH Publishing Co.Pvt. Ltd., New-Delhi.
10. Cheema S.S., D.K. Dhaliwal and T.S. Sahota. Theory and Digest Agronomy.
11. Chhidda Singh. Modern techniques of raising field crops
12. Lenka, D. Climate, weather and crops in India
13. Mavi, H.S. Introduction to Agro-meteorology. Oxford and IBH Publishing Co., New Delhi.
14. Moracban, Y. B. Crop Production and Management. Oxford and IBH Publisher Co. Pvt. Ltd., New Delhi
15. Rajendra Prasad. Field crops
16. Reddy, S.R. Principles of Agronomy. Kalyani Publishers, New Delhi.
17. Singh S.S. Principles and Practices of Agronomy. Kalyani Publishers, New Delhi
18. Singh, S. S. Crop Management under irrigated and rainfed condition. Kalyani Publishers, New Delhi
19. Vaidya, V.G., K.R. Sahasrabuddhe and V.S. Khuspe. Crop Production and Field Experimentation. Continental Prakashan, Pune.

Sem-I
AGRB1107T: RURAL SOCIOLOGY & EDUCATIONAL PSYCHOLOGY

Max Marks: 100
Theory: 74 marks
Teaching: 2 hrs per week

Internal Assessment: 26 marks
Duration of the Paper: 3 Hour
Pass Marks: 40%

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

l. Sociology and Rural sociology: Definition and scope, its significance in agriculture extension,
2. Social Ecology, Rural society, Social Groups, Social Stratification,
3. Culture concept, Social Institution,
4. Social Change & Development.

Section B

5. Educational psychology: Meaning & its importance in agriculture extension.
6. Behavior: Cognitive, affective, psychomotor domain,
7. Personality, Learning, Motivation,
8. Theories of Motivation, Intelligence.

Recommended Books

1. Chitambar, J.B. 1973. Introductory rural sociology. New York, John Wilex and Sons.
2. Desai, A.R. 1978. Rural sociology in India. Bombay, Popular Prakashan, 5th Rev. ed.
3. Doshi, S.L. 2007. Rural sociology. Rawat Publishers, Delhi.
4. Jayapalan, N. 2002. Rural sociology. Altani.c Publishers, New Delhi.
5. Sharma, K.L. 1997. Rural society in India. Rawat Publishers, Delhi.
6. Bhatia, H.R. 1965. A Text Book of Educational Psychology, Asia Publishing House, New Delhi.
7. Pujari, D. 2002. Educational Psychology in Agriculture, Agrotech Publishing Academy, Udaipur (Raj.)
8. Bhushan, V. and Sachdeva, D.R. 2010. An introduction to Sociology, Kitab Mahal, NewDelhi.
9. Rao, C.N.S. 2015. Sociology, S.Chand & Company, New Delhi.
10. Maslow, A.H. 1970. Motivation and personality. Harper and Row publishers , New York.
11. Monda!, S. 2014. Text Book of Rural Sociology and Educational Psychology. Kalyani Publishers, New Delhi.
12. Sharma 0 . P. and Somani L. L. 2012. Fundamentals of Rural Sociology and Educational Psychology. Agrotech Pub. Co., Udaipur

PUNJABI UNNERSITY PATIALA
Syllabus for B. Sc.(Hon's in Agriculture) Part-I (Se m. I & II)
Session 2021-22, 2022-2023 & 2023-24

Sem-11

AGRB1208C: FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION

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

I. **Education:** Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning-Meaning, Process, Principles and Steps in Programme Development.
2. Extension systems in India: extension efforts in pre-independenceera (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.) various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.).
3. New trends in agricu lture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.
4. Rural Development: concept, meaning, definition; various rural develop ment programmes launched by Govt. of India.

Section B

5. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.
6. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applicationsin TOT (New and Social Media), media mix strategies;
7. communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication.
8. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

PRACTICAL

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

1. To get acquainted with university extension system.
2. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector;
3. Preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories;
4. Presentation skills exercise; micro teaching exercise;
5. A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level;
6. Visit to NGO and learning from their experience in rural development;
7. Understanding PRA techniques and their application in village development planning;
8. Exposure to mass media.
9. Visit to community radio and television studio for understanding the process of programme production;
10. Script writing, writing for print and electronic media, developing script for radio and television.

Sem-II

AGRB1208C: **Fundamentals of Agricultural Extension Education**

Recommended Books

1. Jalihal, K.A. Veerabhadraiah, V. 2007. Fundamentals of Extension Education and Management in Extension, Concept Publishing Company.
2. Ray, G.L. 2003. Extension Communication and Management. Kalyani Publishers. Fifth revised and enlarged edition.
3. Dahama, O.P. and Bhatnagar, O.P. 2003. Education and Communication for Development. Oxford and IBH Publishing Co. Pvt. Ltd.
4. Sandhu, A.S. 1993.Textbook on Agricultural Communication: Process and Methods. Oxford and IBH Publishing Co. Pvt. Ltd.
5. Chitambar, J.B. 2008. Introductory Rural Sociology. New Age International (P) Limited.
6. Sachdeva, D. R. and Bhushan, V. 2007. An Introduction to Sociology. KitabMahal Agency.
7. Reddy, A.A. 2001. Extension Education, Baptala: Sri Lakshmi Press.
8. Sehgal, S. and Raghuvanshi, R.S. 2007. Text Book of Community Nutrition. ICAR: New Delhi.

Sem-11

AGRB1209C: COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Max Marks: 100 **Internal Assessment: 14 marks**
Theory: 36 marks **Practical: 50 marks**

THEORY

Teaching: 1 hr 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 8 short-answer type questions of 1.5 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. Communication Skills: Structural and functional grammar; meaning and process of communication,
2. Verbal and nonverbal communication; listening and note taking,
3. Writing skills, oral presentation skills;
4. Field diary and lab record; indexing, footnote and bibliographic procedures.

Section B

5. Reading and comprehension of general and technical articles,
6. precise writing, summarizing, abstracting;
7. individual and group presentations, impromptu presentation, public speaking;
8. Group discussion. Organizing seminars and conferences.

PRACTICAL

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

1. Listening and note taking,
2. Writing skills, oral presentation skills;
3. field diary and lab record;
4. Indexing, footnote and bibliographic procedures.
5. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting;
6. Individual and group presentations.

Sem-11

AGRB1209C: COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Recommended Books

1. Sandhu, A. S. 1999. Textbook on Agricultural Communication; process and methods oxford RIBH Publishing co. Pvt. Ltd. New Delhi.
2. Berlo, David K. 1960. The process of Communication. New Yark, Holt, Rinehart and Winston Inc.
3. Dahama, O. P. and Bhatnagar, O.P. 1998. Education and Communication for Development, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
4. Jalihal, K. A. and Veerabhadraiah, V. 2007. Fundamentals of Extension Education and Management in Extension, Concept publishing company, New Delhi.
5. Ray, G. L. 1991. (1st Edition), Extension Communication and Management, Kalyani Publishers, Ludhiana {7th revised edition - 2010}.
6. Supe, S. V. 2013. (2nd Edition), A Text Book of Extension Education, Agrotech Publishing Academy, Udaipur.
7. M Hilaris. 2011. Indian agriculture and information and communication technology (ICT): Soundari, New century Publications, Carnegie,
8. Dale. 2012. How to Win Friends and Influence People in the Digital Age. Simon & Schuster.
9. Covey Stephen R. 1989. TheSeven Habits of Highly Successful People. Free Press.
10. Verma, K.C. 2013. The Art of Communication. Kalpaz.
11. Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd. New Delhi.
12. Sharma, R. C. and Krishna, Mohan. 1978. Business Correspondence. Tata Mc Graw Hill
13. Adivi Reddy, A. 2001. Extension Education, Sree Lakshmi press, Bapatla

PUNJABI UNIVERSITY PATIALA

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Session 2021-22, 2022-2023 & 2023-24

Sem-11

AGRB1210T

Punjabi Professional/Mudla Gyan/Elementary Punjabi

Qualifying subject

Max Marks: 100
Theory: 75 marks
Teaching: 2 hrs per week

Internal Assessment: 25 marks
Pass Marks: 40%
Duration of the Paper: 3 Hour

SYLLABUS & COURSES OF PUNJABI (FOR PROFESSIONAL COURSES)/ PUNJABI MUDLA GYAN/ ELEMENTORY PUNJABI(FOR STUDENTS OF OTHER STATE) WILL BE AS PER UG (BOARD OF STUDIES) IN PUNJABI, PUNJABI UNIVERSITY, PATIALA

PUNJABI UNIVERSITY PATlALA
Syllabus for B. Sc.(Hon's in Agriculture) Part-I (Sem. I & IJ)
Session 2021-22, 2022-2023 & 2023-24

Sem-11
AGRB1211T
DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION

Qualifying subject

Max Marks: 100
Theory: 75 marks
Teaching: 2 hrs per week

Internal Assessment: 25 marks
Pass Marks: 40%
Duration of the Paper: 3 Hour

COMMON FOR ALL UNDERGRADUATE DEGREE COURSES PART-I (SEMESTER-II) QUALIFYING SUBJECT-DRUG ABUSE:PROBLEM, MANAGEMENT AND PREVENTION

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Sem-I

AGRB1109C: INTRODUCTRY BIOLOGY (FOR NON-MEDICALSTUDENTS)

Max Marks: 100 **Internal Assessment: 14 marks**
Theory: 36 marks **Practical: 50 marks**

THEORY

Teaching: 1 hr 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 8 short-answer type questions of 1.5 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 the living world, diversity and characteristics of life, origin of life,
2. Evolution and Eugenics.
3. Binomial nomenclature and classification
4. Cell and cell division.

Section B

5. Morpho logy of flowing plants.
6. Seed and seed germination.
7. Plant systematic- viz Brassicaceae, Fabaceae and Poaceae.
8. Role of animals in agricu lture.

PRACTICAL

Max. Marks: 50 **Pass Marks: 40%** **Time allowed: 3 Hours** **Teaching: 2 hrs perweek**

J. Morphology of flowering plants - root, stem and leaf and their modifications.
2. Inflorescence, flower and fruits.
3. Cell, tissues & cell division.
4. Internal structure of root, stem and leaf.
5. Study of specimens and slides.
6. Description of plants - Brassicaceae
7. Description of plants - Fabaceae
8. Description of plants - Poaceae.

Recommended Books B k

1. Bhatia, K.N. & Tyagi, MP. 2012. *Trueman's Elementary Biology*. 24th ed. Trueman Book Company.
2. Dhami, P.S. & Mahindru, R.C. 1996. *A Text Book of Biology for 10+2.* Pradeep Publications.
3. Alberts, B., Johnson, A., Lewis J, Raff M, Roberts K &Walter P. 2008. *Molecular Biology of the Cell*. 5th Ed. Garland Science/ Taylor and Francis Group.
4. Lodish, H., Berk, A., Kaiser, C.A., Krieger M, Bretscher A, Ploegh H, Amon A & Scott MP. 2012. *Molecular Cell Biology*. W. H. Freeman.
5. Sadava DE. 1993. *Cell Biology: Organelle Structure and Function*. Jones and Bartlett Publishers.
6. Phundan Singh. 2014. *Essentials of Plant Breeding.* Kalyani Publishers.

Sem-I

AGRB1108T: - ELEMETARY MATHEMATICS

Max Marks: 100
Theory: 74 marks
Teaching: 2 hrs per week

Internal Assessment: 26 marks
Pass Marks: 40%
Duration of the Paper: 3 Hour

INSTRUCTIONS FOR PAPER SETTER

The question paper will consis t 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. Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line,
2. Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line,
3. General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines , Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.
4. Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (Xi, Y1) & (X2,Y2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + j = a2.$

Sect ion B

5. Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x" , ex , sin x & cos x from fist principle, Derivatives of sum, difference, product and quotient of two functions
6. Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form y=f(x) (Simple problems based on it).
7. Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).
8. Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplicatio n, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.

Recommended Books

1. NCERT, 2012. *Mathematics of Class XI.* NCERT India.
2. Sharma, R.D. 2014. *Mathematics of Class XI.* Dhanpat Rai Publisher.
3. NCERT, 2012. *Mathematics of Class XII.* NCERT India.
4. Sharma, R.D. 2014. *Mathematics of Class XII.* Dhanpat Rai Publisher.
5. Chatterjee, S. K. 1970. Mathematical Analysis. Oxford & IBH.
6. Frank, A. (1962). Schaum's Outline of Theory and Problems of Matrices. McGraw-Hill
7. Frank, A. 1967. Theory and Problems of Differential Equations. McGraw-Hill
8. Gentle JE. (2007). Matrix Algebra: Theory, Computations and Applications in Statistics. Springer
9. Narayan, S. (1953). A Text Book of Matrices. S. Chand and Company.
10. Parameswaran, S. (1976). An introduction to mathematics. Oxford & IBH Publishing Co.172p.
11. Priestley, H.A. (1985). Introduction to Complex Analysis. Clarenton Press
12. Walter R. (1976). Principles of Mathematical Analysis. McGraw-Hill.

Sem-1

AGRB1110T: AGRICULTURAL HERITAGE

Max Marks: 50
Theory: 36 marks
Teaching: 1 hr per week

Internal Assessment: 14 marks
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 8 short-answer type questions of 1.5 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 of Indian agricultural heritage; Ancient agricultural practices,
2. Relevance of heritage to present day agriculture;
3. Past and present status of agriculture and farmers in society;
4. Journey of Indian agriculture and its development from past to modern era;

Section B

5. Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world,
6. Agriculture scope; Importance of agriculture and agricu ltural resources available in India; Crop significance and classifications,
7. National agricu1ture setup in India; Current scenario of Indian agriculture,
8. Indian agricultural concerns and future prospects.

Recommended Books

1. ICAR 1989 Handbook of Agriculture, Indian Council of Agricultural Research, New-Delhi
2. Nene, Y.L. 2007. Glimpses of the Agricultural Heritage of India. Asian AgriHistroy Foundation, Secunderabad, Andhra Pradesh.
3. Nene, Y.L., Saxena, R.C. and Choudhary, S.L. 2009. A Textbook on Ancient History of Indian Agriculture, Munshiram Manoharial Publishers Pvt. Ltd,
4. Nene, Y.L., Choudhary, S.L. and Saxena, R.C. 2010. Textbook on Ancient History of Indian Agriculture, Asian Agri-History Foundation.
5. D. Kumari, Manimuthu Veeral. 2014. Text Book on Agricultural Heritage of India. Agrotech Publishing Academy.
6. ICAR. Introductory Agriculture. ICAR e-course. Indian Council of Agricultural Research, New Delhi. (http://www.agrimoon.com/wpcontent/uploads/Introductory-Agriculture.pdf)

AGRB1111T

Punjabi Professional/Mudla Gyan/Elementary Punjabi

Qualifying subject

Max Marks: 100
Theory: 75 marks
Teaching: 2 hrs per week

Internal Assessment: 25 marks
Pass Marks: 40%
Duration of the Paper: 3 Hour

SYLLABUS & COURSES OF PUNJABI (FOR PROFESSIONAL COURSES)/ PUNJABI MUDLA GYAN/ ELEMENTORY PUNJABI (FORSTUDENTS OF OTHER STATE) WILL BE AS PER UG (BOARD OF STUDIES) IN PUNJABI, PUNJABI UNIVERSITY, PATIALA

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Sem-1

AGRB1112T: HUMAN VALUE AND ETHICS

Max Marks: 50 **Internal Assessment: 14 marks**
Theory: 36 marks **Pass Marks: 40%**
Teaching: 1 hr per week **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 8 short-answer type questions of 1.5 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 Band the entire section C.

Section A

I. Values and Ethics-An Introduction. Goal and Mission of Life.
2. Vision of Life. Principles and Philosophy.
3. Self Exploration. Self Awareness. Self Satisfaction.
4. Decision Making. Motivation. Sensitivity.

Section B

5. Success. Selfless Service.
6. Case Study of Ethical Lives.
7. Positive Spirit. Body, Mind and Soul.
8. Attachment and Detachment. Spirituality Quotient. Examin

Sem-1

AGRB1113L:-NSS/NCC/PHYS1CAL EDUCATION & YOGA PRACTICES

This paper will be practical based.

Maximum Marks: 50 **Teaching: 2 hours per week**

Pass marks: 40% **Time: 3 hours**

NSS: NSS-Orientation of students in national problems, study of philosophy of NSS, fundamental rights, directive principles of state policy, socio-economic structure of Indian society, population problems, brief of five year plan. Functional literacy, non-fonnal education of rural youth, eradication of social evils, awareness programmes, consumer awareness, highlights of consumer act. Environment enrichment and conservation, health, family welfare and nutrition.

NCC: Introduction to NCC, defense services, system of NCC training, foot drill, sizing, forming up in three ranks, open and close order march, dressing, getting on parade, dismissing and falling out, saluting, marching, anns drill, shoulder arm, order arm, present arm, guard of honour, ceremonial drill, weapon training - rifle bayonet, light machine gun, sten machine carbine, introduction and characteristic stripping, assembling and cleaning, loading, unloading and firing. Field craft, visual training, targets, judging distance, fire discipline and fire control orders, battle craft, field signals, description of ground, section formation, section battle drill, scouts and patrols, ambush, field engineering, map reading, conventional signs, grid systems, use of service protractor, prismatic compass and its use, self-defense, general principles, precautions and training, attacks and counter attacks, marching and searching, first aid, hygiene and sanitation, civil defense, leadership and NCC song.

Physical Education and Yoga practice: Introduction to physical education. Posture, exercise for good posture, physical fitness exercises for agility, stren gth, coordination, endurance and speed. Rules and regulations of important games, skill development in any one of the games, football, hockey, cricket, volleyball, badminton, throw ball, tennis. Participation in one of the indoor games, badminton, chess and table tennis. Rules and regulations of athletic events, participation in any one of the athletic events, long jump, high jump, triple jump, javelin throw, discuss throw, shot put, short and long distance running, Safety education, movement education, effective way of doing day-to-day activities. First-aid
,, training, coaching for major games and indoor games. Asans and indigenous ways for physical fitness

Sem-11

AGRB1201C:- FUNDAMENTAL OF GENETICS

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. Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity.
2. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance - cell cycle and cell division- mitosis and meiosis.
3. Probability and Chi-square. Dominance relationships, Epistatic interactions with example. Multiple alleles , pleiotropism and pseudoalleles. Sex determination and sex linkage, sex limited and sex influenced traits. Blood group genetics.
4. Linkage and its estimation, crossing over mechanisms. chromosome mapping. Structw-al and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics.

Section -B

5. Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agentsand induction of mutation.
6. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance, Genetic disorders.
7. Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material,
8. Gene concept: Gene structure, function and regulation, Lac and Trp operons.

PRACTICAL

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

1. Study of microscope.
2. Study of cell structure.
3. Mitosis and Meiosis cell division.
4. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross,
5. Experiments on epistatic interactions including test cross and back cross
6. Experiments on probability and Chi-square test.
7. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data).
8. Study on sex linked inheritance in Drosophila.
9. Study of models on DNA and RNA structures.

Recommended Books

1. Singh, B. D. Fundamentals of Genetics - Kalyani Publisher
2. Lewin, B. Genes - Jones and Bartlett Publishers.
3. Strickberger,M. W. Genetics - (McMillan, New York)
4. Gupta, P.K. Genetics. Rastogi Publications.
5. Gardner, E. J., Simmons, M. J. and Snustad, D. P. Principles of Genleftics
6. Sinnott, E.W., Dunn, L.C. and Dobzhansky, T. Principles of Genetics

Sem-II
AGRB1202C: AGRICULTURAL MICROBIOLOGY

Max Marks: 100 **Internal Assessment: 14 marks**
Theory: 36 marks **Practical: 50 marks**

THEORY

Teaching: 1 hr 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 8 short-answer type questions of 1.5 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. Microbial world: Prokaryotic and eukaryotic microbes.
2. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.
3. Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposons.
4. Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.

Section-B

5. Biological nitrogen fixation- symbiotic, asymbiotic and associative.
6. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.
7. Microbes in human welfare: silage production, biofertilizers, biopesticides,
8. Biofuel production and biodegradation of agro-waste.

PRACTICAL

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

1. Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture.
2. Methods of sterilization.
3. Nutritional media and their preparations.
4. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.
5. Methods of isolation and purification of microbial cultures.
6. Isolation of *Rhizobiumfrom* legume root nodule.
7. Isolation of *Azotobacter* from soil.
8. Isolation of *Azospirillum* from roots.
9. Isolation of BGA.
10. Staining and microscopic examination of microbes.

Sem-11

AGRB1202C: AGRICULTURAL MICROBIOLOGY

Recommended Books

l. M T Madigan, and J M Martinko, 2014. *Brock Biology of Microorganisms* 14th Ecln. Pearson.
2. M J Pelczer, 1998. *Microbiology* 5th Edn. Tata Mc. Grow Hill Education Pvt. Ltd.
3. Stainer, R, 1995. *General Microbiology.* Palgrave Macmillan.
4. Edward Alchano, 2002. *Introduction to Microbiology.* Jones and Bartlett hearing.
5. RP Singh, 2007. *General Microbiology.* Kalyani Publishers.
6. J Heritage, E G V Evans, RA Killington, 2008. *Introductory Microbiology.* Cambridge
7. University press P. date.
8. Pelczar,Jr. M.J.E.C.S.Chan and Krieg, N.R. 1996. *Microbiology.* Mc Graw Hill Publishers, New York.
9. Prescott, L.M. Harley, J.P. and Klein, D.A (Sed) 2002. *Microbiology.* Mc Graw Hill Publishers, New York.
10. Madigan, M. Martinkoj, M. and Parker (10 ed.) 2003. *Biology of Microorganisms.* Prentice Hall of India Pvt. Ltd., New Delhi.
11. Davis, B.D. Dullbecco H.S. 1990. Microbiology: 4th Ed. Harper & Row, R. Elisena dn Ginsberg Publishers, Singapore.
12. Tortora, G.J. Funke, B.R. and case, C.L. 1994. *Microbiology: An introduction:* 5lh Ed . The Benjamin/Cunnings Publishing Company, Inc.
13. Purobit,S.S. *2000.Microbiology: Fundamental and Applications* 6th Ed. Agrobios, (India).
14. Postagate, J. 2000. *Microbes & MAN* 4TH Ed, Cambridge Univ., Press. ,.
15. Tortora G.J. Funke B.R. 2001 *Microbiology: An introduction* Benjamin Cummings.

Sem-11

AGRB1203C: SOIL AND WATER CONSERVATION ENGINEERING

Max Marks: 100 **Internal Assessment: 14 marks**
Theory: 36 marks **Practical: 50 marks'·**

THEORY

Te aching: 1 hr per week **Pass Marks: 40%** **Duration of the Paper: 3 Hour**

INSTRUCTIONS FOR PAPER SETTER

The question paper wil·l 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 8 short-answer type questions of 1.5 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

l. Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion.
2. Water erosion: Forms of water erosion.
3. Gully classification and control measures.
4. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

Section B

5. Principles of erosion control: Introduction to contouring, strip cropping and Contour bund.
6. Contour bund. Graded bund and bench terracing. Grassed water ways and their design.
7. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement.
8. Principles of wind erosion control and its control measures.

PRACTICAL

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

1. General status of soil conservation in India.
2. Calculation of erosion index.
3. Estimation of soil loss. Measurement of soil loss.
4. Preparation of contour maps.
5. Design of grassed water ways.
6. Design of contour bunds.
7. Design of graded bunds.
8. Design of bench terracing system.
9. Problem on wind erosion

Sem-11

AGRB1203C: SOIL AND WATER CONSERVATION ENGINEERING

Recommended Books

1. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water
2. Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service, New Delhi.
4. Mal, B.C. 2014. Introduction to Soil and Water Conservation Engineering. 2014. Kalyani Publishers.
5. Murthy, V.V.N. 2002. Land and Water Management Engineering. 4th Edition, Kalyani Publishers, New Delhi.
6. Norman Hudson. 1985. Soil Conservation. Cornell University Press, lthaka, New York, USA.
7. Frevert, R.K., G.O. Schwab, T.W. Edminster and K.K. Barnes. 2009. Soil and Water Conservation Engineering, 4th Edition, John Wiley and Sons, New York.
8. Suresh, R. 2014. Soil and Water ConservationEngineering. Standard Publisher Distributors, New Delhi.
9. Dastane N.G., Singh M., Review of Work done on Water

I0. Hukeri S.B. : Requirement of Crops in India
11. Mickael A.M. and Ojha T.P.2012. *Principles of Agricultural Engg.,* Volume II. Jain Brothers, New Delhi.
12. Mickael, A.M. 2012 *Jrr;gation: Theory and Practices*. Vikas Publishing House Pvt. Ltd., New Delhi.
13. Paliwal, K.V. : Irrigation with Saline Water, IARI, New Delhi.
14. Reddie, T.Y. and Reddy G.H.S.: Efficient use of irrigation water

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Sem-11

AGRB1204C:- FUNDAMENTALS OF CROP PHYSIOLOGY

Max Marks: 100 **Internal Assessment: 14 marks**
Theory: 36 marks **Practical: 50 marks**

THEORY

Teaching: 1 hr 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 8 short-answer type questions of 1.5 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

I. Introduction to crop physiology and its importance in Agriculture
2. Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomata! Physiology
3. Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms
4. Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain

Section B

5. Fat Metabolism: Fatty acid synthesis and Breakdown
6. Plant growth regulators: Physiological roles and agricultural uses
7. Physiological aspects of growth and development of major crops
8. Growth analysis, Role of Physiological growth parameters in crop productivity.

PRACTICAL

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

l. Study of plant cells, structure and distribution of stomata.
2. Demonstration of imbibition, osmosis, and plasmolysis.
3. Measurement of root pressure.
4. Measurement o rate of transpiration.
5. Separation of photosyntheticpigments through paper chromatography.
6. Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients
7. Estimation of relative water content,
8. Measurement of photosynthetic CO2 assimilation by Infra Red Gas Analyser (IRGA).

Recommended Books

1. Gupta, N. K. & Gupta, S. 2004. Plant Physiology. Oxford and IBH publication, New Delhi.
2. Pandey, S. N. and Sinha, B. K.1995. Vikas Publishing House Pvt. Ltd., new Delhi
3. Salisbury, J. B. and Ross, C.W. 1992. Plant Physiology, Wadswar Publishing Company, Belmont, California
4. Taiz, L. and Zieger, E. 2006. Plant Physiology. 4th Ed. Sinauer Associates
5. Jain V.K. Fundamentals of Plant Physiology

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Sem-11

AGRB1205T:- FUNDAMENTALS OF AGRICULTURAL ECONOMICS

Max Marks: 100 **Teaching: 2 hrs per week**
Theory: 74 marks **Pass Marks: 40%**
Internal Assessment: 26 marks **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

I. **Introduction:** - Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationa lity assumption, concept of equilibrium, economic laws as generalization of liluman behavio r. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agricu lture, importance and its role in economic development. Agricultural planning and development in the country.

2. **Theory of Demand:** - Meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi- marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measu remen t of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship.

3. **Laws of returns** & **Supply:** - Law of variable proportions and law of returns to scale. Cost: concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply.

4. **Market structures** & **Distribution theories:** -Meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

SECTIONB

5. **Population** & **National Income:** - Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: importance, Malthusian and Optimum population theories, natural and socioeconomic determinants, current policies and programmes on population control.

6. **Money** & **Banking:** - Barter system of exchange and its problems, evoluti on, meaning and functions of money, classification of money, supply, general price index, inflation and deflation. Banking: Ro le in modern economy, types of banks, functions of commercial and central bank, credit creation policy.

7. **Agricultural and public finance:** - Meaning, micro v/s mac ro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT.

8. **Economic systems:** - Concepts of economy and its functions, important features of capitalistic, soc ialistic and mixed economies, elem ents of economic planning.

Recommended Books

I. Dominick Salvatore, 20I I, Outline of Microeconomics, Schaum's Outline Series.
2. Bhavani Devi,P. Raghu Ram,S. Subba Reddy,T.V. Neelakanta Sastry, 2009, Agricultural economics, Oxford and IBH Co. Pvt. Ltd., , New Delhi.
3. K. K. Dewett and J. D. Varma, 1986, Elementary Economic Theory, S. Chand & Company, New Delhi.
4. Latika Sharma et al (2014) Principles of agricultural economics, Agrotech publishers, Udaipur.
5. M.L. Jhingan, 2004, Micro Economic Theory, Vikas Publishing House Pvt. Ltd., New Delhi.

S em-11

AGRB1206C: FUNDAMENTALS OF PLANT PATHOLOGY

Max Marks: 200 **Internal Assessment: 40 marks**
Theory: 110 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. *Introduction:* Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in plantpathology.
2. Pathogenesis. Causes/factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens.
3. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them.
4. Diseases and symptoms due to abiotic causes. Types of parasitism and variability in plant pathogens.

Section B

5. *Fungi:* general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.
6. *Bacteria and mollicutes:* general morphological characters. Basic methods of classification and reproduction. *Viruses:* nature, structure, replication and transmission. Study of phanerogamic parasites.
7. *Nematodes:* General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes *(Heterodera, Meloidogyne, Anguina, Radopholus* etc.)
8. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants. Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Sem-11

AGRB1206C: FUND AMENTALS OF PLANT PATHOLOGY

PRACTICAL

Max. Marks: 5O Pass Marks: 40% Time allowed: 3 Hours Teaching:2 hrs per week

1. Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen
2. Preparation of media, isolation and Koch's postulates. General study of different structures of fungi.
3. Study of symptoms of various plant diseases
4. Study of representative fungal genera.
5. Staining and identification of plant pathogenic bacteria.
6. Transmission of plant viruses.
7. Study of phanerogamic plant parasites.
8. Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting.
9. Study of fungicides and their formulations.
10. Methods of pesticide application and their safe use.
11. Calculation of fungicide sprays concentrations

Recommended Books

1. Agrios GN. 2005. Plant Pathology. 5th Ed. Academic Press, New York. (Indian Ed.)
2. Mehrotra, R.S. and Aggarawal, A. 2007. Plant Pathology. Tata McGraw Hill PublishingCo. Ltd., New Delhi
3. Singh, R.S. 2005. 4th ed. Principles of Plant Pathology. Oxford & IBH, New Delhi.
4. Nene, Y.L. 20I5. Fungicides in Plant Diseases Control. Oxford & IBH published Co. Pvt. Ltd., New Delhi
5. Vander plank, J.E. (2014) Host Pathogen Interactions in Plant Diseases. A.P.
6. Singh, R.P. 2013. Plant Pathology. Kalyani Publishers
7. Alexopoulos CJ, Mims CW & Blackwell M. 2000. Introductory Mycology.5th Ed. John Wiley & Sons, New York.
8. Dube, H.C. 2012. Mordem Plant Pathology, Agro Bios, India
9. Lakshrnan, H.C. 2014. Bio-fertilizers and Bio-pesticides. Pointer Publishers

Sem-II

AGRB1207C:- FUNDAMENTALS OF ENTOMOLOGY

Max Marks: 200 **Internal Assessment: 40 marks**
Theory: 110 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. History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda.
2. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus.
3. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae.
4. Structure and functions of digestive, circulatory, excretory, respiratory, nervous,secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Majorsensory organs like simple and compound eyes, chemoreceptor.

Section B

5. 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. Categories of pests. Concept of IPM, Practices, scope and limitations of IPM.
6. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control importance, hazards and limitations. Recent methods of pest control, repellents, anti feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.
7. Systematics: Taxonomy -importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order.
8. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidac, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Terrnitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae,Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Satumidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae.Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

PRACTICAL

Max. Marks: 50 **Pass Marks: 40%** **Time allowed: 3 Hours** **Teaching: 2 hrs perweek**

1. Methods of collection and preservation of insects including immature stages.
2. External features of Grasshopper/Blister beetle;
3. Types of insect antennae, mouthparts and legs;
4. Wing venation, types of wings and wing coupling apparatus.
5. Types of insect larvae and pupae.
6. Dissection of digestive system in insects (Grasshopper);
7. Dissection of male and female reproductive systems in insects (Grasshopper).

8. Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera,Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.
9. Insecticides and their formulations.
10. Pesticide appliances and their maintenance.
11. Sampling techniques for estimation of insect population and damage.

Recommended Books

1. Gullan, P.J. and Cranston, P.S. 2014. *The insects: an outline of entomology.* John Wiley & Sons.
2. Alford, D.V. 1999. *A textbook of Agricultural Entomology.* Blackwell Science Ltd.
3. Ross, H.H. 2013A Tet Book Of Entomology. John Wiley And Sons, Inc.,; New York; Chapman And Hall, Limited; London;
4. Richards, O.W. 2012. Imms' Outline of Entomology. Springer Science & Business Media.
5. Davies, R.G. 2012 editor. Outlines of entomology. Springer Science & Business Media.
6. Nayar KK, Ananthakrishnan TN, David BV. General and applied entomology.
7. David, B.V. 2004. General and applied entomology. Tata McGraw-Hill Education.
8. Chapman, R. F. 1998. The insects: structure and function. Cambridge university press.
9. Pruthi, H.S. 1969. Textbook on agricultural entomology.
10. Mishra, R.C. 1995. Honeybees and their management in India. Indian Council of Agricultural Research Krishi Anusandhan Bhavan Pusa; New Delhi.
11. Atwal, A.S. 1976. Agricultural Pests of India and South-East Asia. Agricultural pests of India and South-East Asia.
12. Metcalf, C.L. and Flint, WP. 1962. Destructive and useful insects. Their habits and control. Destructive and useful insects. Their habits and control.
13. Snodgrass, R.E. 2001. Principles of Insect Morphology.CBS Publishers and Distributors, New Delhi.
14. Pedigo, L.P. and Rice, M.E. 2014.Entomology and pest management. Waveland Press.
15. Srivastava, P.D. and Singh, R.P. 1997. An introduction to entomology. Concept Publishing Company.
16. Saxena, S.C. 1992. Biology of insects. Oxford & IBH
17. Gatoria, G. S. 2014 Introductory Entomology Unistar Education