

**Outline of the Syllabus for Semester-VII**  
**B. Sc. Agriculture (Hons.) Course (Semester System)**  
**Semester-VII**

**ELECTIVE OPTION: SOIL SCIENCE**

Paper Code	Subject	Periods per week		External assessment		Internal assessment		Total marks		Grand Total
		T	P	T	P	T	P	T	P	
Gen. 701	Principles of Plant Biotechnology	3	1	40	20	10	5	50	25	75
Gen. 702	Fundamentals of Farm Business Management	3	1	40	20	10	5	50	25	75
Soil .701	Introduction to Soil	3	1	40	20	10	5	50	25	75
Soil .702	Management of Problematic Soil and Water	3	1	40	20	10	5	50	25	75
PCP-701	Practical crop production	0	4	0	50	0	0	0	50	50
Soil. 709	Rural Agricultural Work Experience	0	4	0	0	0	100	0	100	100
	Total	<b>12</b>	<b>12</b>	<b>160</b>	<b>130</b>	<b>40</b>	<b>120</b>	<b>200</b>	<b>250</b>	<b>450</b>

**Outline of the Syllabus for Semester-VIII**  
**B.Sc. Agriculture (Hons.) Course (Semester System)**  
**Semester-VIII**

**ELECTIVE OPTION: SOIL SCIENCE**

Paper Code	Subject	Periods per week		External assessment		Internal assessment		Total marks		Grand Total
		T	P	T	P	T	P	T	P	
Soil.703	Soil and Plant Analysis	3	1	40	20	10	5	50	25	75
Soil .704	Organic Farming and Soil Health	3	1	40	20	10	5	50	25	75
PCP-701	Practical crop production	0	4	0	50	0	0	0	50	50
Soil. 710	Rural Agricultural Work Experience	0	4	0	0	0	100	0	100	100
<b>Total</b>		<b>6</b>	<b>10</b>	<b>80</b>	<b>90</b>	<b>20</b>	<b>110</b>	<b>100</b>	<b>200</b>	<b>300</b>

**Outline of the Syllabus for Semester-VII**  
**B.Sc. Agriculture (Hons.) Course (Semester System)**  
**Semester-VII**

<b>ELECTIVE OPTION: HORTICULTURE</b>										
<b>Paper Code</b>	<b>Subject</b>	<b>Periods per week</b>		<b>External assessment</b>		<b>Internal assessment</b>		<b>Total marks</b>		<b>Grand Total</b>
		<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	
Gen. 701	Principles of Plant Biotechnology	3	1	40	20	10	5	50	25	75
Gen. 702	Fundamentals of Farm Business Management	3	1	40	20	10	5	50	25	75
Hort.701	Introductory Horticulture	3	1	40	20	10	5	50	25	75
Hort .702	Protected Cultivation of Horticultural Crops	3	1	40	20	10	5	50	25	75
PCP-701	Practical crop production	0	4	0	50	0	0	0	50	50
HORT. 709	Rural Agricultural Work Experience	0	4	0	0	0	100	0	100	100
<b>Total</b>		<b>12</b>	<b>12</b>	<b>160</b>	<b>130</b>	<b>40</b>	<b>120</b>	<b>200</b>	<b>250</b>	<b>450</b>

**Outline of the Syllabus for Semester-VIII  
B.Sc. Agriculture (Hons.) Course (Semester System) -VIII**

<b>ELECTIVE OPTION: HORTICULTURE</b>										
<b>Paper Code</b>	<b>Subject</b>	<b>Periods per week</b>		<b>External assessment</b>		<b>Internal assessment</b>		<b>Total marks</b>		<b>Grand Total</b>
		<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	
Hort .703	Post harvest technology of fruits, vegetables and flower crops	3	1	40	<b>20</b>	10	5	50	25	75
Hort .704	Propagation and nursery management	3	1	40	<b>20</b>	10	5	50	25	75
PCP-701	Practical crop production	0	4	0	<b>50</b>	0	0	0	50	50
Hort. 710	Rural Agricultural Work Experience	0	4	0	<b>0</b>	0	<b>100</b>	0	100	100
Total		<b>6</b>	<b>10</b>	<b>80</b>	<b>90</b>	<b>20</b>	<b>110</b>	<b>100</b>	<b>200</b>	<b>300</b>

**Outline of the Syllabus for Semester-VII**  
**B.Sc. Agriculture (Hons.) Course (Semester System)**  
**Semester-VII**

<b>ELECTIVE OPTION: AGRONOMY</b>										
<b>Paper Code</b>	<b>Subject</b>	<b>Period per week</b>		<b>External assessment</b>		<b>Internal assessment</b>		<b>Total marks</b>		<b>Grand Total</b>
		<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	
Gen. 701	Principles of Plant Biotechnology	3	1	40	20	10	5	50	25	75
Gen. 702	Fundamentals of Farm Business Management	3	1	40	20	10	5	50	25	75
Agron.701	Principles of Agronomy	3	1	40	20	10	5	50	25	75
Agron .703	Modern Concepts in Crop Production	3	0	40	20	10	5	50	25	75
PCP-701	Practical Crop Production	0	4	0	50	0	0	0	50	50
Agron. 709	Rural Agricultural Work Experience	0	4	0	0	0	100	0	100	100
<b>Total</b>		<b>12</b>	<b>11</b>	<b>160</b>	<b>130</b>	<b>40</b>	<b>120</b>	<b>200</b>	<b>250</b>	<b>450</b>

B.Sc. Agriculture (Hons.) Syllabus (7<sup>th</sup> & 8<sup>th</sup> Semester) for 2018-19 & 2019-20

**Outline of the Syllabus for Semester-VIII**  
**B.Sc. Agriculture (Hons.) Course (Semester System)**  
**Semester-VIII**

<b>ELECTIVE OPTION: AGRONOMY</b>										
<b>Paper Code</b>	<b>Subject</b>	<b>Period per week</b>		<b>External assessment</b>		<b>Internal assessment</b>		<b>Total marks</b>		<b>Grand Total</b>
		<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	
Soil.704	Organic farming and soil health	3	1	40	20	10	5	50	25	75
Agron.704	Dry land farming and watershed management	3	1	40	20	10	5	50	25	75
PCP-701	Practical crop production	0	4	0	50	0	0	0	50	50
Agron. 710	Rural Agricultural Work Experience	0	4	0	0	0	100	0	100	100
<b>Total</b>		<b>6</b>	<b>10</b>	<b>80</b>	<b>90</b>	<b>20</b>	<b>110</b>	<b>100</b>	<b>200</b>	<b>300</b>

**Outline of the Syllabus for Semester-VII**  
**B.Sc. Agriculture (Hons.) Course (Semester System)**  
**Semester-VII**

<b>ELECTIVE OPTION: GENETICS AND PLANT BREEDING</b>										
<b>Paper Code</b>	<b>Subject</b>	<b>Periods per week</b>		<b>External assessment</b>		<b>Internal Assessment</b>		<b>Total marks</b>		<b>Grand Total</b>
		<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	
Gen. 701	Principles of Plant Biotechnology	3	1	40	20	10	5	50	25	75
Gen. 702	Fundamentals of Farm Business Management	3	1	40	20	10	5	50	25	75
GPB-701	Principals of Genetics	3	1	40	20	10	5	50	25	75
GPB-702	Principals of Breeding	3	1	40	20	10	5	50	25	75
PCP-701	Practical crop production	0	4	0	50	0	0	0	50	50
Agron. 709	Rural Agricultural Work Experience	0	4	0	0	0	100	0	100	100
	<b>Total</b>	<b>12</b>	<b>12</b>	<b>160</b>	<b>130</b>	<b>40</b>	<b>120</b>	<b>200</b>	<b>250</b>	<b>450</b>

**Outline of the Syllabus for Semester-VIII**  
**B.Sc. Agriculture (Hons.) Course (Semester System)**  
**Semester-VIII**

<b>ELECTIVE OPTION: GENETICS AND PLANT BREEDING</b>										
<b>Paper Code</b>	<b>Subject</b>	<b>Periods per week</b>		<b>External assessment</b>		<b>Internal Assessment</b>		<b>Total marks</b>		<b>Grand Total</b>
		<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	<b>T</b>	<b>P</b>	
GPB- 703	Principals of Cytogenetics	3	1	40	20	10	5	50	25	75
GPB- 704	Fundamentals of Seed Technology	3	1	40	20	10	5	50	25	75
PCP-701	Practical crop production	0	4	0	50	0	0	0	50	50
Agron. 709	Rural Agricultural Work Experience	0	4	0	0	0	100	0	100	100
	<b>Total</b>	<b>6</b>	<b>10</b>	<b>80</b>	<b>90</b>	<b>20</b>	<b>110</b>	<b>100</b>	<b>200</b>	<b>300</b>



# **Mata Gujri College**

**Sri Fatehgarh Sahib**

**(An Autonomous College)**

**Affiliated to Punjabi University Patiala**

**Syllabus**

**For**

**B. Sc. Agriculture (Honors) Second Year**

**(8<sup>th</sup> Semester)**



**Academic Session 2018-2019 & 2019-20**

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Gen.701: PRINCIPLES OF PLANT BIOTECHNOLOGY**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

UNIT I

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement: Totipotency and Morphogenesis, Techniques of In-vitro cultures, Micro propagation. Introduction of anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture.

UNIT II

Somaclonal variation, Somatic embryogenesis and synthetic seed. Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering; Restriction enzymes. Transgenic plants and their applications. Blotting techniques – DNA finger printing – DNA based markers – RFLP, AFLP, RAPD, SSR. MAS and its application in crop improvement.

**Practical**

1. Requirements for Plant Tissue Culture Laboratory;
2. Techniques in Plant Tissue Culture;
3. Media components and preparations;
4. Sterilization techniques and Inoculation of various explants; Aseptic manipulation of various explants;

5. Anther, Embryo and Endosperm culture;
6. Demonstration of Isolation of DNA.
7. Demonstration of gel-electrophoresis techniques.

**Suggested Readings**

1. Chopra VL & Nasim A. 1990. *Genetic Engineering and Biotechnology: Concepts, Methods and Applications*. Oxford & IBH.
2. Gupta PK. 1997. *Elements of Biotechnology*. Rastogi Publ.
3. Hackett PB, Fuchs JA & Messing JW. 1988. *An Introduction to Recombinant DNA Technology - Basic Experiments in Gene Manipulation*. 2nd Ed. Benjamin Publ.Co.
4. Sambrook J and Russel D. 2001. *Molecular Cloning-a LABOTATORY Manual* (III Ed) Cold Spring Harbor Lab. Press, USA.
5. Singh BD. 2005. *Biotechnology, Expanding Horizons*. Kalyani.

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Gen.702 FUNDAMENTALS OF FARM BUSINESS MANAGEMENT**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**UNIT I**

Agribusiness: Meaning, Definition, Structure of Agribusiness, (Input, Farm, Product Sectors) Importance of Agribusiness in the Indian Economy, Agricultural Policy. AgribusinessManagement, Distinctive features, Importance of Good Management, Definitions of Management. Management Functions, Planning, Meaning, Definition, Types of Plans(Purpose or Mission, Goals or Objectives, Strategies, Policies, Procedures, rules, programmes, Budget) characteristics of sound plan, Steps in planning, Organisation, Staffing, Directing,otivation, Ordering, Leading, Supervision, Communication, control. Capital Management.

**UNIT II**

Financial Management of Agribusiness: Importance of Financial Statements, Balance sheet,Profit and Loss Statement, Analysis of Financial statements. Agro-based Industries:Importance and Need, Classification of Industries, Types of Agro-based Industries, Institutional arrangement, Procedure to set up agro-based industries, Constraints inestablishing agro-based industries. Marketing Management: Meaning, Definitions, MarketingMix, 4Ps of Marketing. Mix, Market segmentation, Methods of Market, Product life cycle.Pricing policy, Meaning, pricing method. Prices at various stages of Marketing. Project, definitions, project cycle, Identification, Formulation, Appraisal, Implementation, Monitoring and evaluation, Appraisal and Evaluation techniques, NPW, BCR, IRR, N/K ratio, sensitivity analysis, characteristics of agricultural projects: preparation of project

reports for various activities in agriculture and allied sectors: Dairying, poultry, fisheries, agro-industries etc.

### **Practical**

1. Study of input markets: seed, fertilizers, pesticides.
2. Study of output markets, grains, fruits, vegetables, flowers.
3. Study of product markets, retail trade commodity trading, value added products.
4. Study of financing institutions cooperatives commercial banks, RRBs, Agribusiness Finance Limited, NABARD; Preparations of projects.

### **Suggested Reading**

1. W. David Downey and John K Trocke, Agribusiness Management, Mc Graw Hill Book Co. New Delhi/ New York
2. A. C Broadway A. A Broadway, A Text Book of Agri-Business Management , Kalyani Publishers, Ludhiana/New Delhi
3. U. K Pandey, An Introduction to Agricultural Finance, Kalyani Publishers New Delhi
4. V S Ramaswamy and S Namakumari, Marketing Management, Macmillan Publishers India ltd. New Delhi

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Soil.702 MANAGEMENT OF PROBLEMATIC SOIL AND WATER**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Area and distribution of problem soils – acidic, saline, sodic and physically degraded soils; origin and basic concept of problematic soils, and factors responsible. Morphological features of saline, sodic and saline-sodic soils; characterization of salt-affected soils - soluble salts, ESP, pH; physical, chemical and microbiological properties.

**Unit II**

Management of salt-affected soils; salt tolerance of crops - mechanism and ratings; monitoring of soil salinity in the field; management principles for sandy, clayey, red lateritic and dry land soils. Reclamation of problematic soils.

**Practical**

1. Characterization of acid, acid sulfate, salt-affected and calcareous soils.
2. Determination of cations ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$ ) in ground water and soil samples.
3. Determination of anions ( $\text{Cl}^-$ ,  $\text{SO}_4^{--}$ ,  $\text{CO}_3^{--}$  and  $\text{HCO}_3^-$ ) in ground waters and soil samples.
4. Lime and gypsum requirements of acid and sodic soils.

**Suggested Reading**

1. Brady NC & Weil RR. 2002. *The Nature and Properties of Soils*. 13th Ed. Pearson Edu.
2. Kabata-Pendias A & Pendias H. 1992. *Trace Elements in Soils and Plants*. CRC Press.
3. Kannaiyan S, Kumar K & Govindarajan K. 2004. *Biofertilizers Technology*. ScientificPubl.
4. Leigh JG. 2002. *Nitrogen Fixation at the Millennium*. Elsevier.
5. Mengel K & Kirkby EA. 1982. *Principles of Plant Nutrition*. International PotashInstitute, Switzerland.
6. Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. *Micronutrients in Agriculture*. 2nd Ed. SSSA, Madison.
7. Pierzinsky GM, Sims TJ & Vance JF. 2002. *Soils and Environmental Quality*. 2<sup>nd</sup>Ed. CRC Press.
8. Stevenson FJ & Cole MA. 1999. *Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients*. John Wiley & Sons.
9. Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. *Soil Fertility and Fertilizers*. 5<sup>th</sup>Ed. Prentice Hall of India.

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Soil.701: INTRODUCTION TO SOIL**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Pedological and edaphological concepts. Origin of the Earth's crust, Composition soil and earth. Weathering, Soil formation factors and processes. Soil profile, Soil physical properties, Soil texture, Textural classes, Soil structure, Classification, Soil aggregates, Soil consistency, Soil crusting, Bulk density and particle density of soils & porosity and their significance and manipulation. Soil colour, Soil water, Retention and potentials, Soil moisture constants, Movement of soil water, Infiltration, Percolation, Permeability, Drainage. Methods of determination of soil moisture.

**Unit II**

Thermal properties of soils, Soil temperature, Soil air, Gaseous exchange, Influence of soil temperature and air on plant growth. Soil colloids: Properties, nature, types and significance; Layer silicate clays, and sources of charges. Adsorption of ions, Ion exchange, CEC & AEC, Soil reaction and buffering capacity. Factors influencing ion exchange and its Significance. Problem soils – acid, salt affected and calcareous soils, characteristics. Reclamation of acid and salt affected soil – mechanical, chemical and biological methods. Irrigations water – Quality of irrigation water and its appraisal. Indian standards for water quality. Use of saline water for agriculture.



### **Practical**

1. Collection and processing of soil sample.
2. Identification of rocks and minerals.
3. Determination of bulk density and particle density,
4. Soil moisture determination,
5. Soil moisture constants – Field capacity, permanent wilting point,
6. Maximum Water holding, capacity Infiltration rate,
7. Soil texture and mechanical analysis of soil by hydrometer and pipet method,
8. Soil temperature, Soil analysis for CEC, pH, EC, soluble cations & anions.

### **Suggested Reading**

1. Text book of soil science Mukherjee S.K 1987 kalayani New Delhi
2. Manual on methods for physical and chemical analysis of soils Raina J.N, Sharma J.C, Sharma I.P, and 2007 Nauni-Solan
3. Brady NC & Weil RR. 2002. *The Nature and Properties of Soils*. 13th Ed. Pearson Edu.
4. Kabata-Pendias A & Pendias H. 1992. *Trace Elements in Soils and Plants*. CRC Press.
5. Kannaiyan S, Kumar K & Govindarajan K. 2004. *Biofertilizers Technology*. Scientific Publ.
6. Leigh JG. 2002. *Nitrogen Fixation at the Millennium*. Elsevier.
7. Mengel K & Kirkby EA. 1982. *Principles of Plant Nutrition*. International Potash Institute, Switzerland.
8. Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. *Micronutrients in Agriculture*. 2nd Ed. SSSA, Madison.
9. Pierzinsky GM, Sims TJ & Vance JF. 2002. *Soils and Environmental Quality*. 2<sup>nd</sup>Ed. CRC Press.
10. Stevenson FJ & Cole MA. 1999. *Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients*. John Wiley & Sons.
11. Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. *Soil Fertility and Fertilizers*. 5<sup>th</sup>Ed. Prentice Hall of India.

**B.Sc. AGRICULTURE (HONS.) VIII SEMESTER**

**SOILS.703: SOIL AND PLANT ANALYSIS**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Methods of soil and plant sampling and processing for analysis. Quantification of minerals and their abundance. Soil structure and aggregate analysis. Theories and concepts of soil moisture estimation – gravimetric, tensiometric, gypsum block, neutron probe and pressure methods. Characterization of hydraulic mobility – diffusion and mass flow. Renewal of gases in soil and their abundance. Methods of estimation of oxygen diffusion rate and redox potential. Soil fertility evaluation methods.

**Unit II**

Use of radio tracer techniques in soil fertility evaluation. Soil micro-organisms and their importance. Saline, alkali, acid, waterlogged and sandy soils, their appraisal and management. Chemical and mineral composition of horticultural crops. Leaf analysis standards, index tissue, interpretation of leaf analysis values. Principles of working of pH meter, electrical conductivity meter, spectrophotometer, flame photometer and atomic absorption spectrophotometer. Quality of irrigation water.

**Practical**

1. Collection and preparation of soil and plant samples for analysis.
2. Determination of water holding capacity and hydraulic conductivity of soil.

**B. Sc. Agriculture (Honors) Syllabus (4<sup>th</sup> Semester) for 2018-19 & 2019-20**

3. Estimation of moisture content of soils and plants.
4. Determination of pH, electrical conductivity, sodium adsorption ratio and exchangeable sodium percentage of soils.
5. Enumeration of soil microbes.
6. Estimation of available macro and micronutrient elements in soils and their contents in plants. Irrigation water quality analysis.
7. Estimation of organic carbon and available nitrogen in soil.
8. Soil fertility evaluation by Neubauer technique.

**Suggested Readings**

1. Brady NC & Weil RR. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
2. Kabata-Pendias A & Pendias H. 1992. Trace Elements in Soils and Plants. CRC Press.
3. Kannaiyan S, Kumar K & Govindarajan K. 2004. Biofertilizers Technology. ScientificPubl.
4. Leigh JG. 2002. Nitrogen Fixation at the Millennium. Elsevier.
5. Mengel K & Kirkby EA. 1982. Principles of Plant Nutrition. International PotashInstitute, Switzerland.
6. Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. Micronutrients in Agriculture. 2nd Ed. SSSA, Madison.
7. Pierzinsky GM, Sims TJ & Vance JF. 2002. Soils and Environmental Quality. 2ndEd. CRC Press.
8. Stevenson FJ & Cole MA. 1999. Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients. John Wiley & Sons.
9. Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. Soil Fertility and Fertilizers. 5thEd. Prentice Hall of India.

**B.Sc. AGRICULTURE (HONS.) VIII SEMESTER**

**Soil.704 ORGANIC FARMING AND SOIL HEALTH**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Organic farming – Concepts, and practices – management. Components- Organic farming for sustainable agriculture- Manures – bulky and concentrated – FYM – Compost – rural, urban, vermicompost, coirpith etc. Enrichment of organic manures. Sewage and sludge, green manures – potentials and limitations. Quality parameters of organic manures and specifications. Recycling of organic residue. Industrial effluents and heavy metal contamination – bio remediation and phyto remediation.

**Unit II**

Biofertilizers. Soil micro flora – nutrient transformations. Soil health – concept and assessment – Soil Health Card. Soil enzymes – biological tests – harmful effect of non judicious chemical fertilization. Role of microorganisms in degradation of pesticides. Integrated Nutrient Management (INM) and Integrated Plant Nutrient Supply System (IPNS). NPOP, organic produce quality considerations, certification, labeling, accreditation process and marketing.

## **Practical**

1. Sampling of manure materials - moisture determination, bulk density,pH, E.C,
2. Estimation of organic carbon, total nitrogen, C:N ratio, phosphorus and potassium in manures/ compost.
3. Estimation of heavy metals.
4. Preparation of soil samples for chemical and biological tests
5. Determination of soil biological activity by monitoring dehydrogenase activity.
6. Determination of urease activity in soil
7. Study of cellulose decomposition and CO<sub>2</sub> evolution.
8. Nitrate reductase activity in soils.
9. Preparation of vermicompost and other manures -preparation of enriched manures.

### **Suggested readings**

1. Lampin N. 1990. *Organic Farming*. Press Books, Ipswitch, UK.
2. Palaniappan SP & Anandurai K. 1999. *Organic Farming – Theory and Practice*. Scientific Publ.
3. Rao BV Venkata. 1995. *Small Farmer Focused Integrated Rural Development: Socioeconomic*
4. *Environment and Legal Perspective*: Publ. 3, Parisaraprajna Parishtana, Bangalore.
5. Reddy MV. (Ed.). 1995. *Soil Organisms and Litter Decomposition in the Tropics*. Oxford & IBH.
6. Sharma A. 2002. *Hand Book of Organic Farming*. Agrobios.
7. Singh SP. (Ed.) 1994. *Technology for Production of Natural Enemies*. PDBC, Bangalore.

**ELECTIVE- AGRONOMY**

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Gen.701: PRINCIPLES OF PLANT BIOTECHNOLOGY**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 2+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**UNIT I**

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement: Totipotency and Morphogenesis, Techniques of In-vitro cultures, Micro propagation. Introduction of anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture.

**UNIT II**

Somaclonal variation, Somatic embryogenesis and synthetic seed. Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering; Restriction enzymes. Transgenic plants and their applications. Blotting techniques – DNA finger printing – DNA based markers – RFLP, AFLP, RAPD, SSR. MAS and its application in crop improvement.

**Practical**

1. Requirements for Plant Tissue Culture Laboratory;
2. Techniques in Plant Tissue Culture;
3. Media components and preparations;
4. Sterilization techniques and Inoculation of various explants;

5. Aseptic manipulation of various explants; Anther,
6. Embryo and Endosperm culture; Demonstration of Isolation of DNA.
7. Demonstration of gel-electrophoresis techniques.

**Suggested Readings**

1. Chopra VL & Nasim A. 1990. *Genetic Engineering and Biotechnology: Concepts, Methods and Applications*. Oxford & IBH.
2. Gupta PK. 1997. *Elements of Biotechnology*. Rastogi Publ.
3. Hackett PB, Fuchs JA & Messing JW. 1988. *An Introduction to Recombinant DNA Technology - Basic Experiments in Gene Manipulation*. 2nd Ed. Benjamin Publ.Co.
4. Sambrook J and Russel D. 2001. *Molecular Cloning-a LABOTATORY Manual* (III Ed) Cold Spring Harbor Lab. Press, USA.
5. Singh BD. 2005. *Biotechnology, Expanding Horizons*. Kalyani.

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Gen.702 FUNDAMENTALS OF FARM BUSINESS MANAGEMENT**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Agribusiness: Meaning, Definition, Structure of Agribusiness, (Input, Farm, Product Sectors) Importance of Agribusiness in the Indian Economy, Agricultural Policy. AgribusinessManagement, Distinctive features, Importance of Good Management, Definitions of Management. Management Functions, Planning, Meaning, Definition, Types of Plans(Purpose or Mission, Goals or Objectives, Strategies, Polices, Procedures, rules, programmes, Budget) characteristics of sound plan, Steps in planning, Organisation, Staffing, Directing,otivation, Ordering, Leading, Supervision, Communication, control. Capital Management.

**Unit II**

Financial Management of Agribusiness: Importance of Financial Statements, Balance sheet,Profit and Loss Statement, Analysis of Financial statements. Agro-based Industries:Importance and Need, Classification of Industries, Types of Agro-based Industries, Institutional arrangement, Procedure to set up agro-based industries, Constraints inestablishing agro-based industries. Marketing Management: Meaning, Definitions, MarketingMix, 4Ps of Marketing. Mix, Market segmentation, Methods of Market, Product life cycle.Pricing policy, Meaning, pricing method. Prices at various stages of Marketing. Project, definitions, project cycle, Identification, Formulation, Appraisal, Implementation, Monitoring and evaluation, Appraisal and Evaluation techniques, NPW, BCR, IRR, N/K ratio, sensitivity analysis, characteristics of agricultural projects: preparation of project reports for various activities in agriculture and allied sectors: Dairying, poultry, fisheries, agro-industries etc.



### **Practical**

1. Study of input markets: seed, fertilizers, pesticides.
2. Study of output markets, grains, fruits, vegetables, flowers.
3. Study of product markets, retail trade commodity trading, value added products.
4. Study of financing institutions cooperatives commercial banks, RRBs,
5. Agribusiness Finance Limited, NABARD;
6. Preparations of projects.

### **Suggested Reading**

1. W. David Downey and John K Trocke, Agribusiness Management, Mc Graw Hill Book Co. New Delhi/ New York
2. A. C Broadway A. A Broadway, A Text Book of Agri-Business Management , Kalyani Publishers, Ludhiana/New Delhi
3. U. K Pandey, An Introduction to Agricultural Finance, Kalyani Publishers New Delhi
4. V S Ramaswamy and S Namakumari, Marketing Management, Macmillan Publishers India ltd. New Delhi

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER  
AGRON 701- PRINCIPLES OF AGRONOMY**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Agronomy – definition, meaning and scope. Crops and major soils – Classification. Factors affecting crop production- climatic, edaphic, biotic, physiographic and socio economic factors. Seeds- Seed rate, Sowing Methods, Germination, Crop stand establishment, Planting geometry. Role of manures and fertilizers in crop production and FUE. Inter cultivation - Thinning - Gap filling and their intercultural operations.

**Unit II**

Irrigation: definition, scheduling and methods, Modern techniques of irrigation, Drainage and its importance. Planting Geometry and its effect on Growth and Yield of crops. Cropping pattern and cropping system - Intensive cropping- Sustainable agriculture, IFS. Organic/ eco-friendly agriculture, Concepts and principles. Agro-climatic zones of India and Punjab, agro ecological zones of India.

**Practical**

1. Estimation of crop yield on the basis of yield attributes
2. Formulation of cropping schemes for various farm sizes
3. Calculation of cropping and rotational intensity.

**Suggested Reading**

1. Reddy SR. 2000. *Principles of Crop Production*.
2. Kalyani. Panda SC. 2003. *Cropping and Farming Systems*. Agrobios

**B. Sc. Agriculture (Honors) Syllabus (4<sup>th</sup> Semester) for 2018-19 & 2019-20**

3. Sankaran S & Mudaliar TVS. 1997. *Principles of Agronomy*. The Bangalore Printing & Publ.
4. Singh SS. 2006. *Principles and Practices of Agronomy*. Kalyani.
5. Tisdale SL, Nelson WL, Beaton JD & Havlin JL. 1997. *Soil Fertility and Fertilizers*. Prentice Hall.

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**AGRON. 703- MODERN CONCEPTS IN CROP PRODUCTION**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Crop growth analysis in relation to environment. Inverse yield nitrogen law; Mitscherlich and Baule unit. Effect of lodging in cereals; optimization of plant population and planting geometry, concept of ideotype of plant and crop modeling for desired crop yield.

**Unit I**

Scientific principles of crop production; concept of soil plant relations; yield and environmental stress. Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, and integrated nutrient management; precision agriculture. Hydroponics and Aeroponics.

**Suggested Reading**

1. Katyal JC & Farrington J. 1995. *Research for Rainfed Farming*. CRIDA.
2. Rao SC & Ryan J. 2007. *Challenges and Strategies of Dryland Agriculture*. Scientific Publ.
3. Singh P & Maliwal PL. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publ. Company.
4. Singh RP. 1988. *Improved Agronomic Practices for Dryland Crops*. CRIDA.
5. Singh RP. 2005. *Sustainable Development of Dryland Agriculture in India*. Scientific Publ.

**B.Sc. AGRICULTURE (HONS.) VIII SEMESTER**

**Soil.702: ORGANIC FARMING AND SOIL HEALTH**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Organic farming – Concepts, and practices – management. Components- Organic farming for sustainable agriculture- Manures – bulky and concentrated – FYM – Compost – rural, urban, vermicompost, coirpith etc. Enrichment of organic manures. Sewage and sludge, green manures – potentials and limitations. Quality parameters of organic manures and specifications. Recycling of organic residue. Industrial effluents and heavy metal contamination – bio remediation and phyto remediation.

**Unit II**

Biofertilizers. Soil micro flora – nutrient transformations. Soil health – concept and assessment – Soil Health Card. Soil enzymes – biological tests – harmful effect of non judicious chemical fertilization. Role of microorganisms in degradation of pesticides. Integrated Nutrient Management (INM) and Integrated Plant Nutrient Supply System (IPNS). NPOP, organic produce quality considerations, certification, labeling, accreditation process and marketing.

**Practical**

1. Sampling of manure materials
2. Determination of moisture, bulk density
3. Estimation of pH, EC, organic carbon, C:N ratio in manures/ compost.
4. Estimation of total nitrogen, phosphorus and potassium in manures/ compost.

5. Estimation of heavy metals.
6. Preparation of soil samples for chemical and biological tests
7. Determination of soil biological activity by monitoring dehydrogenase activity.
8. Study of cellulose decomposition and CO<sub>2</sub> evolution.
9. Preparation of vermicompost and other manures- preparation of enriched manures.

**Suggested Readings**

8. Lampin N. 1990. *Organic Farming*. Press Books, Ipswich, UK.
9. Palaniappan SP & Anandurai K. 1999. *Organic Farming – Theory and Practice*. Scientific Publ.
10. Rao BV Venkata. 1995. *Small Farmer Focused Integrated Rural Development: Socioeconomic*
11. *Environment and Legal Perspective*: Publ. 3, Parisaraprajna Parishtana, Bangalore.
12. Reddy MV. (Ed.). 1995. *Soil Organisms and Litter Decomposition in the Tropics*. Oxford & IBH.
13. Sharma A. 2002. *Hand Book of Organic Farming*. Agrobios.
14. Singh SP. (Ed.) 1994. *Technology for Production of Natural Enemies*. PDBC, Bangalore.

**B.Sc. AGRICULTURE (HONS.) VIII SEMESTER**

**AGRON. 704- DRYLAND FARMING AND WATERSHED MANAGEMENT**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week 2+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Definition, concept, classification, and characteristics of dry land farming. Constraints limiting crop production in dry land areas; Drought: definition, types. Characterization of environment for water availability; crop planning for erratic and aberrant weather conditions. Adaptation of crop plants to drought, drought management strategies; Mid contingent plan for aberrant weather conditions.

**Unit II**

Tillage, tilth, and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants, evaporation retardants, soil and crop management techniques, seeding and efficient fertilizer use. Watershed: Concept, components, problems, and management.

**Practical**

1. Seed treatment, seed germination and crop establishment in relation to soil moisture contents
2. Moisture stress effects and recovery behaviour of important crops.
3. Estimation of moisture index and aridity index.

4. Preparation of crop plans for different drought conditions
5. Study of field experiments relevant to dry land farming
6. Visit to dry land research stations and watershed projects.

**Suggested Readings**

1. Katyal JC & Farrington J. 1995. *Research for Rainfed Farming*. CRIDA.
2. Rao SC & Ryan J. 2007. *Challenges and Strategies of Dryland Agriculture*. Scientific Publ.
3. Singh P & Maliwal PL. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publ. Company.
4. Singh RP. 1988. *Improved Agronomic Practices for Dryland Crops*. CRIDA.
5. Singh RP. 2005. *Sustainable Development of Dryland Agriculture in India*. Scientific Publ.



**ELECTIVE GENETICS & PLANT BREEDING**

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Gen.701: PRINCIPLES OF PLANT BIOTECHNOLOGY**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement: Totipotency and Morphogenesis, Techniques of In-vitro cultures, Micro propagation. Introduction of anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture. Somaclonal variation, Somatic embryogenesis and synthetic seed.

**Unit II**

Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering; Restriction enzymes. Transgenic plants and their applications. Blotting techniques – DNA finger printing – DNA based markers – RFLP, AFLP, RAPD, SSR. MAS and its application in crop improvement.

**Practical**

1. Requirements for Plant Tissue Culture Laboratory;
2. Techniques in Plant Tissue Culture;
3. Media components and preparations;
4. Sterilization techniques and Inoculation of various explants;

5. Aseptic manipulation of various explants;
6. Anther, Embryo and Endosperm culture;
7. Demonstration of Isolation of DNA.
8. Demonstration of gel-electrophoresis techniques.

### **Suggested Readings**

1. Chopra VL & Nasim A. 1990. *Genetic Engineering and Biotechnology: Concepts, Methods and Applications*. Oxford & IBH.
2. Gupta PK. 1997. *Elements of Biotechnology*. Rastogi Publ.
3. Hackett PB, Fuchs JA & Messing JW. 1988. *An Introduction to Recombinant DNA Technology - Basic Experiments in Gene Manipulation*. 2nd Ed. Benjamin Publ.Co.
4. Sambrook J and Russel D. 2001. *Molecular Cloning-a LABOTATORY Manual* (III Ed) Cold Spring Harbor Lab. Press, USA.
5. Singh BD. 2005. *Biotechnology, Expanding Horizons*. Kalyani.

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Gen.702 FUNDAMENTALS OF FARM BUSINESS MANAGEMENT**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**UNIT I**

Agribusiness: Meaning, Definition, Structure of Agribusiness, (Input, Farm, Product Sectors) Importance of Agribusiness in the Indian Economy, Agricultural Policy. Agribusiness Management, Distinctive features, Importance of Good Management, Definitions of Management. Management Functions, Planning, Meaning, Definition, Types of Plans(Purpose or Mission, Goals or Objectives, Strategies, Policies, Procedures, rules, programmes, Budget) characteristics of sound plan, Steps in planning, Organisation, Staffing, Directing, motivation, Ordering, Leading, Supervision, Communication, control. Capital Management.

**UNIT II**

Financial Management of Agribusiness: Importance of Financial Statements, Balance sheet, Profit and Loss Statement, Analysis of Financial statements. Agro-based Industries:Importance and Need, Classification of Industries, Types of Agro-based Industries, Institutional arrangement, Procedure to set up agro-based industries, Constraints inestablishing agro-based industries. Marketing Management: Meaning, Definitions, MarketingMix, 4Ps of Marketing. Mix, Market segmentation, Methods of Market, Product life cycle.Pricing policy, Meaning, pricing method. Prices at various stages of Marketing. Project, definitions, project cycle, Identification, Formulation, Appraisal, Implementation, Monitoring and evaluation, Appraisal and Evaluation techniques, NPW, BCR, IRR, N/K ratio, sensitivity analysis, characteristics of agricultural projects: preparation of project reports for various activities in agriculture and allied sectors: Dairying, poultry, fisheries, agro-industries etc.

### **Practical**

1. Study of input markets: seed, fertilizers, pesticides.
2. Study of output markets, grains, fruits, vegetables, flowers.
3. Study of product markets, retail trade commodity trading, value added products.
4. Study of financing institutions cooperatives commercial banks, RRBs, Agribusiness Finance Limited, NABARD; Preparations of projects.

### **Suggested Reading**

1. W. David Downey and John K Trocke, Agribusiness Management, Mc Graw Hill Book Co. New Delhi/ New York
2. A. C Broadway A. A Broadway, A Text Book of Agri-Business Management , Kalyani Publishers, Ludhiana/New Delhi
3. U. K Pandey, An Introduction to Agricultural Finance, Kalyani Publishers New Delhi
4. V S Ramaswamy and S Namakumari, Marketing Management, Macmillan Publishers India Ltd. New Delhi

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**GPB 701 PRINCIPLES OF GENETICS**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Genetics; definition and history, Early concepts of Inheritance; Mendel's laws; Chromosomal theory of inheritance; Multiple alleles; Gene interactions; Sex determination, differentiation and sex-linkage; Sex-influenced and sex limited traits; Linkage. Extra chromosomal inheritance; Nature, structure and replication of the genetic material.

**Unit II**

Genetic fine structure analysis; Split genes; Transposable genetic elements; Overlapping genes, Pseudogenes. Regulation of gene, mutation and mutagenesis, transposable (Tn) elements; gene expression and regulation in eukaryotes; DNA and its structure. Population- Mendelian population, random mating population.

**Practical**

1. Demonstration of genetic principles.
2. Chromosome mapping using three point test cross.
3. Induction and detection of mutations through genetic tests;
4. DNA extraction
5. Visit to experimental farm, glasshouse and learning some practical considerations.

**Suggested Readings:**

1. Gardner EJ & Snustad DP. 1991. *Principles of Genetics*. John Wiley & Sons.
2. Klug WS & Cummings MR. 2003. *Concepts of Genetics*. Peterson Edu.
3. Lewin B. 2008. *Genes IX*. Jones & Bartlett Publ.
4. Russell PJ. 1998. *Genetics*. The Benzamin/Cummings Publ. Co.
5. Snustad DP & Simmons MJ. 2006. *Genetics*. 4th Ed. John Wiley & Sons.
6. Strickberger MW. 2005. *Genetics*. 3rd Ed. Prentice Hall.
7. Tamarin RH. 1999. *Principles of Genetics*. Wm. C. Brown Publs.
8. Uppal S, Yadav R, Subhadra & Saharan RP. 2005. *Practical Manual on Basic and Applied Genetics*. Dept. of Genetics, CCS HAU, Hisar.
9. *Applied Genetics*. Dept. of Genetics, CCS HAU, Hisar.

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**GPB 702 PRINCIPLES OF PLANT BREEDING**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

History of Plant Breeding (Pre and post Mendelian era), Principles and objectives of plant breeding. Patterns of Evolution in Crop Plants- Centres of Origin-biodiversity and its significance; maintenance breeding, Plant breeders' rights and regulations for plant variety protection and farmers rights. Plant introduction and role of plant genetic resources in plant breeding.

**Unit II**

Pure line theory; pure line selection and mass selection methods pedigree, bulk, backcross, single seed descent and multiline method; Special breeding techniques- Mutation breeding, Breeding for abiotic and biotic stresses. Self-incompatibility and male sterility in crop plants; concept of plant ideotype and its role in crop improvement.

**Practical**

1. Floral biology in self and cross pollinated species,
2. Selfing and crossing techniques in field crop.
3. Selection methods in segregating populations and evaluation of breeding material.
4. Estimation of heritability and genetic advance.

5. Learning techniques in hybrid seed production using male-sterility in field crops.

### **Suggested Readings**

1. Allard RW. 1981. *Principles of Plant Breeding*. John Wiley & Sons.
2. Chopra VL. 2001. *Breeding Field Crops*. Oxford & IBH.
3. Chopra VL. 2004. *Plant Breeding*. Oxford & IBH.
4. Gupta SK. 2005. *Practical Plant Breeding*. Agribios.
5. Pohlman JM & Bothakur DN. 1972. *Breeding Asian Field Crops*. Oxford & IBH.
6. Roy D. 2003. *Plant Breeding, Analysis and Exploitation of Variation*. Narosa Publ. House.
7. Sharma JR. 2001. *Principles and Practice of Plant Breeding*. Tata McGraw-Hill.
8. Simmonds NW. 1990. *Principles of Crop Improvement*. English Language Book Society.
9. Singh BD. 2006. *Plant Breeding*. Kalyani.
10. Singh P. 2006. *Essentials of Plant Breeding*. Kalyani.
11. Singh S & Pawar IS. 2006. *Genetic Bases and Methods of Plant Breeding*. CBS.



**B.Sc. AGRICULTURE (HONS.) VIII SEMESTER**

**GPB 703 PRINCIPLES OF CYTOGENETICS**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Architecture of chromosome in prokaryotes and eukaryotes; Chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere  
Artificial chromosome construction and its uses; Special types of chromosomes  
Chromosomal theory of inheritance– Cell Cycle and cell division– mitosis and meiosis.

**Unit II**

Structural and Numerical variations of chromosomes and their implications -Symbols and terminologies for chromosome numbers- euploidy- haploids, diploids and polyploids; Polyploidy and role of polyploids in crop breeding; Role of aneuploids in basic and applied aspects of crop breeding; Apomixis: Synthesis of new crops (wheat, triticale and brassica)

**Practical**

1. Learning the cytogenetics laboratory, various chemicals to be used for fixation, dehydration, embedding, staining, cleaning etc.
2. Microscopy: various types of microscopes.
3. Studies on the course of mitosis in wheat, pearl millet.
4. Studies on the course of mitosis in onion.
5. Studies on the course of meiosis in cereals, millets and pulses
6. Studies on the course of meiosis in oilseeds and forage crops
7. Studies on anther culture and ovule culture.

**Suggested Readings**

1. Becker K & Hardin. 2004. *The World of Cell*. 5th Ed. Pearson Edu.
2. Carroll M. 1989. *Organelles*. The Guilford Press.
3. Charles B. 1993. *Discussions in Cytogenetics*. Prentice Hall.
4. Darlington CD & La Cour LF. 1969. *The Handling of Chromosomes*. Georger Allen &Unwin Ltd.
5. Elgin SCR. 1995. *Chromatin Structure and Gene Expression*. IRL Press.
6. Gray P. 1954. *The Mirotomist's Formulatory Guide*. The Blakiston Co.
7. Gupta PK. 2000. *Cytogenetics*. Rastogi Publ.
8. Johansson DA. 1975. *Plant Microtechnique*. McGraw Hill.
9. Karp G. 1996. *Cell and Molecular Biology: Concepts and Experiments*. John Wiley & Sons.
10. Khush GS, 1973 *Cytogenetics of Aneuploids*. Academic Press.
11. Sharma AK & Sharma A. 1988. *Chromosome Techniques: Theory and Practice*. Butterworth.
12. Sumner AT. 1982. *Chromosome Banding*. Unwin Hyman Publ.
13. Swanson CP. 1960. *Cytology and Cytogenetics*. Macmillan & Co.

**B.Sc. AGRICULTURE (HONS.) VIII SEMESTER**

**GPB 704 FUNDAMENTAL OF SEED TECHNOLOGY**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Variety Development and Maintenance- Define variety, cultivar, extant variety, essentially derived variety, independently derived variety, reference variety, farmers variety, hybrid, and population. Mode of pollination and reproduction in crop plants, generation system of seed multiplication; Hybrid Seed- Methods of development of hybrids; use of male sterility and self-incompatibility and CHA in hybrid seed production.

**Unit II**

One, two and three line system; Quality seed production technology of self and cross-pollinated crop varieties viz. cereals & millets (wheat, paddy, pearl millet, maize); pulses (greengram, blackgram, cowpea, pigeonpea, lentil); oilseeds (groundnut, linseed, rapeseed and mustard); fibres (cotton, jute) and vegetables (tomato, brinjal, capsicum, okra ).

**List of Practical's**

1. Planning of Seed Production
2. Ear-to-row method and nucleus seed production
3. Main characteristics of released and notified varieties, hybrids and parental lines
4. Determination of isolation distance and planting ratios in different crops

5. Seed production techniques in different crops
6. Hybrid seed production technology of important crops
7. Hand emasculation and pollination in vegetables
8. Detasseling in Corn
9. Visits to seed production plots

### **Suggested Readings**

1. Agarwal RL. 1997. *Seed Technology*. 2nd Ed. Oxford & IBH.
2. Chhabra AK. 2006. *Practical Manual of Floral Biology of Crop Plants*. Department of Plant Breeding. CCS HAU Hisar.
3. Kelly AF. 1988. *Seed Production of Agricultural Crops*. Longman.
4. McDonald MB Jr & Copeland LO. 1997. *Seed Production: Principles and Practices*. Chapman & Hall.
5. Musil AF. 1967. *Identification of Crop and Weed Seeds*. Handbook No. 219, USDA, Washington, DC.
6. Poehlman JM & Borthakur D. 1969. *Breeding Asian Field Crops*. Oxford & IBH.
7. Singh BD. 2005. *Plant Breeding: Principles and Methods*. Kalyani.
8. Thompson JR. 1979. *An Introduction to Seed Technology*. Leonard Hill.
9. Tunwar NS & Singh SV. 1985. *Handbook of Cultivars*. ICAR.

**ELECTIVE - HORTICULTURE**

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Gen.701: PRINCIPLES OF PLANT BIOTECHNOLOGY**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement: Totipotency and Morphogenesis, Techniques of In-vitro cultures, Micro propagation. Introduction of anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture. Somaclonal variation, Somatic embryogenesis and synthetic seed.

**Unit II**

Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering; Restriction enzymes. Transgenic plants and their applications. Blotting techniques– DNA finger printing– DNA based markers– RFLP, AFLP, RAPD, SSR. MAS and its application in crop improvement.

**Practical**

1. Requirements for Plant Tissue Culture Laboratory;
2. Techniques in Plant Tissue Culture;
3. Media components and preparations;

4. Sterilization techniques and Inoculation of various explants;
5. Anther, Embryo and Endosperm culture;
6. Demonstration of Isolation of DNA.
7. Demonstration of gel-electrophoresis techniques.

### **Suggested Readings**

1. Chopra VL & Nasim A. 1990. *Genetic Engineering and Biotechnology: Concepts, Methods and Applications*. Oxford & IBH.
2. Gupta PK. 1997. *Elements of Biotechnology*. Rastogi Publ.
3. Hackett PB, Fuchs JA & Messing JW. 1988. *An Introduction to Recombinant DNA Technology - Basic Experiments in Gene Manipulation*. 2nd Ed. Benjamin Publ.Co.
4. Sambrook J and Russel D. 2001. *Molecular Cloning-a LABORATORY Manual* (III Ed) Cold Spring Harbor Lab. Press, USA.
5. Singh BD. 2005. *Biotechnology, Expanding Horizons*. Kalyani.

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**Gen.702 FUNDAMENTALS OF FARM BUSINESS MANAGEMENT**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week: 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**UNIT I**

Agribusiness: Meaning, Definition, Structure of Agribusiness, (Input, Farm, Product Sectors) Importance of Agribusiness in the Indian Economy, Agricultural Policy. AgribusinessManagement, Distinctive features, Importance of Good Management, Definitions of Management. Management Functions, Planning, Meaning, Definition, Types of Plans(Purpose or Mission, Goals or Objectives, Strategies, Polices, Procedures, rules, programmes, Budget) characteristics of sound plan, Steps in planning, Organisation, Staffing, Directing,otivation, Ordering, Leading, Supervision, Communication, control. Capital Management.

**UNIT II**

Financial Management of Agribusiness: Importance of Financial Statements, Balance sheet, Profit and Loss Statement, Analysis of Financial statements. Agro-based Industries:Importance and Need, Classification of Industries, Types of Agro-based Industries, Institutional arrangement, Procedure to set up agro-based industries, Constraints inestablishing agro-based industries. Marketing Management: Meaning, Definitions, MarketingMix, 4Ps of Marketing. Mix, Market segmentation, Methods of Market, Product life cycle.Pricing policy, Meaning, pricing method. Prices at various stages of Marketing. Project, definitions, project cycle, Identification, Formulation, Appraisal, Implementation, Monitoring and evaluation, Appraisal and Evaluation techniques, NPW, BCR, IRR, N/K ratio, sensitivity analysis, characteristics of agricultural projects: preparation of project reports for various activities in agriculture and allied sectors: Dairying, poultry, fisheries, agro-industries etc.

### **Practical**

1. Study of input markets: seed, fertilizers, pesticides.
2. Study of output markets, grains, fruits, vegetables, flowers.
3. Study of product markets, retail trade commodity trading, value added products.
4. Study of financing institutions cooperatives commercial banks, RRBs, Agribusiness Finance Limited, NABARD;
5. Preparations of projects.

### **Suggested Reading**

1. W. David Downey and John K Trocke, Agribusiness Management, Mc Graw Hill Book Co. New Delhi/ New York
2. A. C Broadway A. A Broadway, A Text Book of Agri-Business Management , Kalyani Publishers, Ludhiana/New Delhi
3. U. K Pandey, An Introduction to Agricultural Finance, Kalyani Publishers New Delhi
4. V S Ramaswamy and S Namakumari, Marketing Management, Macmillan Publishers India Ltd. New Delhi



**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**ELECTIVE - HORTICULTURE**

**HORT. 701 INTRODUCTORY HORTICULTURE**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Definition, branches, importance and scope of horticulture; Status of horticultural crops in Punjab, India and world. Horticultural institutes. Agro-climatic zones of Indian and Punjab. Environmental factors affecting growth and development of Horticultural crops. Nursery raising and management; Propagation, dormancy, photo-periodism.

**Unit II**

Irrigation systems, mulching. Integrated nutrient, disease, insect, pest and weed management. Micro-propagation. Kitchen gardening, Plant growth regulators and its use in horticulture, physiological disorders and deficiency symptoms Export and marketing of horticultural produce.

**List of Practical's**

1. Bed preparation.
2. Calculation of fertilizer doses
3. Preparation of vermicompost unit.
4. Preparation of standard solutions.
5. Calculation of irrigation requirement.
6. Dormancy breaking methods.
7. Weed management and types of mulching.

8. Identification of different horticultural crops.

**Suggested Readings:**

1. Pradeepkumar T, Suma B, Jyothibhaskar & Satheesan KN. 2007. *Management of Horticultural Crops*. Parts I, II. New India Publ. Agency.
2. Peter KV. 2008. (Ed.). *Basics of Horticulture*. New India Publ. Agency.
3. Bose TK, Mitra SK & Sanyol D. (Ed.). 2002. *Fruits of India – Tropical and Sub-tropical*. 3rd Ed. Vols. I, II. Naya Udyog.
4. Chadha KL & Pareek OP. 1996. (Eds.). *Advances in Horticulture*. Vol. I. Malhotra Publ. House.
5. Chadha KL & Shikhamany SD. 1999. *The Grape: Improvement, Production and Post-Harvest Management*. Malhotra Publ. House.
6. Hartmann HT & Kester DE. 1989. *Plant Propagation – Principles and Practices*. Prentice Hall of India.

**B.Sc. AGRICULTURE (HONS.) VII SEMESTER**

**HORT. 702 PROTECTED CULTIVATION OF HORTICULTURAL CROPS**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Greenhouse – World scenario, Indian situation: present and future. Different agro climatic zones in India. Basics of greenhouse design, different types of structures – glasshouse, shade net, poly tunnels - Design and development of low cost greenhouse structures. Interaction of light, temperature, humidity and CO<sub>2</sub> on crop regulation.

**Unit II**

Greenhouse heating, cooling, ventilation and shading. Types of ventilation- Forced cooling techniques - Glazing materials – Micro irrigation and Fertigation. General POP commercially cultivated Fruits—strawberry, papaya, vegetables- Capsicum, Tomato, Seedless Cucumber, Broccoli, Flowers- Rose, Gerbera, Carnation, Gladiolus.

**Practicals:**

1. Designs of greenhouse, low cost poly tunnels, nethouse.
2. Regulation of light, temperature, humidity in greenhouses.
3. Media.
4. Greenhouse cooling systems.
5. Ventilation systems.
6. Fertigation systems.
7. Project preparation for greenhouses.
8. Visit to greenhouses.

**Suggested Readings:**

1. Aldrich RA & Bartok JW. 1994. *Green House Engineering*. NRAES, Riley, Robb Hall, Cornell University, Ithaca, New York.
2. Bhattacharjee BS. 1959. *Rose Growing in Tropics*. Thackarspink & Co.
3. Laurie A, Kiplingr DD & Nelson KS. 1968. *Commercial Flower Forcing*. McGraw Hill.
4. Mears DR, Kim MK & Roberts WJ. 1971. Structural Analysis at an Experimental Cable-supported Air Inflated Green Houses. Trans.ASAE.
5. Pant V Nelson. 1991. *Green House Operation and Management*. Bali Publ.
6. Pradeepkumar T, Suma B, Jyothibhaskar & Satheesan KN. 2007. *Management of Horticultural Crops*. Parts I, II. New India Publ. Agency.

**B.Sc. AGRICULTURE (HONS.) VIII SEMESTER**

**HORT 703 POST HARVEST TECHNOLOGY OF FRUITS, VEGETABLES AND  
FLOWER CROPS**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Definition and Importance of postharvest technology, maturity and ripening, Principles of Post harvest Technology, quality management for fresh fruits, vegetables and flowers marketing, storage of fruits, vegetables and flowers - ventilated, refrigerated, MAS, CA, evaporative cold storage, fruit and vegetable processing, canning of Fruits and Vegetables. Irradiation, packaging of fresh and processed fruit and vegetable products, fruit and vegetable based products- Squash, RTS, Syrup, tomato puree, paste, ketchup, sauces, Jam, Jellies, Marmalade and candied fruit, principal and methods of preservation.

**Unit II**

Layout and establishment of processing industry, FPO licence, quality assurance and quality control, TQM, GMP, Food standards – FPO, PFA, etc. Food laws and regulations, Food safety – Hazard analysis and critical control points (HACCP), Utilization of fruit and vegetable processing waste. Drying and dehydration of fruits, vegetables and flowers.

**List of Practical's**

1. Physiological loss in weight of fruits and vegetables
2. Improved packing and storage of important horticultural commodities
3. Preparation and analysis of syrups and Brines for the preservation of fruits and vegetables.
4. Preparation of fruits and vegetable products e.g. Jam, jellies, marmalades, ketchup and sauces.
5. Collection of different type of packaging materials for solid and liquid food

6. Sensory evaluation of fresh and processed fruits and vegetables
7. Visit to cold storage and Processing units
8. Project preparation for fruits and vegetable products

**Suggested Readings**

1. Arthey D & Dennis C. 1996. *Vegetable Processing*. Blackie/Springer- Verlag.
2. Chadha DS. 2006. *The Prevention of Food Adulteration Act*. Confed. of Indian Industry.
3. Desrosier NW. 1977. *Elements and Technology*. AVI Publ. Co.
4. FAO. 1997. *Fruit and Vegetable Processing*. FAO.
5. FAO. *CODEX Alimentarius: Joint FAO/WHO Food Standards Programme*. 2<sup>nd</sup> Ed. Vol. VB. *Tropical Fresh Fruits and Vegetables*. FAO.
6. FAO. *Food Quality and Safety Systems – Training Manual on Food Hygiene and HACCP*. FAO.
7. Fellow's P. 1988. *Food Processing Technology*. Ellis Horwood International.
8. Frazier WC & Westhoff DC. 1995. *Food Microbiology*. 4<sup>th</sup> Ed. Tata McGraw Hill.
9. Giridharilal GS, Siddappa & Tandon GL. 1986. *Preservation of Fruits and Vegetables*. ICAR.
10. Gisela J. 1985. *Sensory Evaluation of Food – Theory and Practices*. Ellis Horwood.
11. Graham HD. 1980. *Safety of Foods*. AVI Publ. Co.
12. Mahindru SN. 2004. *Food Safety: Concepts and Reality*. APH Publ. Corp.
13. Ranganna S. 1986. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. 2<sup>nd</sup> Ed. Tata-McGraw Hill.
14. Shapiro R. 1995. *Nutrition Labeling Handbook*. Marcel Dekker.
15. Srivastava RP & Kumar S. 2003. *Fruit and Vegetable Preservation: Principles and Practices*. 3<sup>rd</sup> Ed. International Book Distri. Co.
16. Verma LR & Joshi VK. 2000. *Post-harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management*. Indus Publ. Co.

**B.Sc. AGRICULTURE (HONS.) VIII SEMESTER**

**HORT. 704: PROPAGATION AND NURSERY MANAGEMENT**

**Time: 3 Hours**

**Max. Marks: 75**

**Periods per Week 3+1**

**Theory: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Practical: 25**

**Instructions for the Paper Setters**

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 carry 6 marks each. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry ½ marks for each. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire Section-C.

**Theory**

**Unit I**

Introduction to nursery. Principles and factors influencing seed germination of horticultural crops, Dormancy. Asexual propagation – rooting of soft and hard wood cutting under mist by growth regulators. Rooting of cuttings. Layering – principle and methods. Budding and grafting – selection of elite mother plants.

**Unit II**

Establishment of bud wood bank, stock, scion and inter stock, relationship. Incompatibility. Rejuvenation through top working. Micro-propagation – principles and concepts, commercial exploitation in horticultural crops. Nursery - types, structures, components, planning and layout. Nursery certification procedure.

**Practical**

1. Model preparation of propagation structures
2. Cutting, Layering , Budding, Grafting
3. Commercial methods of raising of nursery for important fruits, vegetables and flower crops
4. Propagation Tools
5. Micro propagation, media preparation

6. Explant preparation, culturing and Hardening
7. Meristem culture
8. Visit to TC labs and Commercial nurseries.

**Suggested Readings:**

1. Hartmann HT & Kester DE. 2015. *Plant Propagation – Principles and Practices*. Prentice Hall of India.
2. Bose TK, Mitra SK & Sadhu MK. 1991. *Propagation of Tropical and Subtropical Horticultural Crops*. NayaProkash.
3. Peter KV. (Ed.). 2008. *Basics of Horticulture*. New India Publ. Agency.
4. Singh SP. 1989 *Mist Propagation*. Metropolitan Book Co.
5. Rajan S & Baby LM. 2007. *Propagation of Horticultural Crops*. New India Publ. Agency.
6. Radha T & Mathew L. 2007. *Fruit Crops*. New India Publ. Agency.