

# FACULTY OF SCIENCES

## SYLLABUS

### FOR

## Bachelor of Vocation (B.Voc.) (AGRI FOOD SCIENCE)

(SEMESTER: I-IV)

Examinations: 2019-20



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# GURU NANAK DEV UNIVERSITY AMRITSAR

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BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER SYSTEM)

**SCHEME**

**Semester-I**

(Aligned with Level 4 of Sector Skill Council- Qualification Pack- Assistant Lab Technician Food and Agricultural Commodities ( FIC/Q7601)

Paper Code	Subject	Credits	Theory Marks	Duration	Practical Marks	Total Marks
<b>GENERAL EDUCATION COMPONENT</b>						
PAPER-I	Communication Skills in English-I	3	50	3 hrs	-	<b>50</b>
PAPER-II	Punjabi Compulsory <b>OR</b> *ਮੁੱਢਲੀ ਪੰਜਾਬੀ <b>OR</b> **Punjab History & Culture	3	50	3 hrs	-	<b>50</b>
PAPER-III	***Drug Abuse: Problem, Management and Prevention (Compulsory)	3	50	3 hrs	-	-
<b>SKILL COMPONENT</b>						
PAPER-IV	Introduction to Food Science	6+3	75	3 hrs	25	<b>100</b>
PAPER-V	Crop Science	6+3	75	3 hrs	25	<b>100</b>
PAPER-VI	Fundamentals of Biochemistry	6+3	75	3 hrs	25	<b>100</b>
PAPER-VII	Industrial Training	2	-	-	-	<b>S/US</b>
					<b>TOTAL=</b>	<b>400</b>

**Note:**

1. \*Special Paper in lieu of Punjabi Compulsory.
2. \*\*For those students who are not domicile of Punjab
3. \*\*\*This paper marks will not be included in the total marks.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER SYSTEM)

**SEMESTER-II**

(Aligned with Level 5 of Sector Skill Council- Qualification Pack- Food Products Packing Technician ( FIC/Q7001)

Paper Code	Subject	Credits	Theory Marks	Practical Marks	Duration	Total Marks
<b>GENERAL EDUCATION COMPONENT</b>						
<b>PAPER-I</b>	Communication Skills in English-II	3	<b>50</b>	-	<b>3 hrs</b>	<b>50</b>
<b>PAPER-II</b>	Punjabi Compulsory <b>OR</b> *ਮੁੱਢਲੀ ਪੰਜਾਬੀ/ <b>OR</b> **Punjab History & Culture	3	<b>50</b>	-	<b>3 hrs</b>	<b>50</b>
<b>PAPER-III</b>	***Drug Abuse: Problem, Management and Prevention (Compulsory)	3	<b>50</b>	-	<b>3 hrs</b>	-
<b>SKILL COMPONENT</b>						
<b>PAPER-IV</b>	Fundamentals of Genetics	6+3	<b>75</b>	<b>25</b>	<b>3 hrs</b>	<b>100</b>
<b>PAPER-V</b>	Food Processing	6+3	<b>75</b>	<b>25</b>	<b>3 hrs</b>	<b>100</b>
<b>PAPER-VI</b>	Crop Physiology	6+3	<b>75</b>	<b>25</b>	<b>3 hrs</b>	<b>100</b>
<b>PAPER-VII</b>	Industrial Training	2	-	-		S/US
					<b>TOTAL=</b>	<b>400</b>

**Note:**

1. \*Special Paper in lieu of Punjabi Compulsory.
2. \*\*For those students who are not domicile of Punjab
3. \*\*\*This paper marks will not be included in the total marks.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER SYSTEM)

**Semester-III**

**(Aligned with Level 6 of Sector Skill Council- Qualification Pack- Food Regulatory Affair Manager (FIC/Q9002))**

<b>PAPER</b>	<b>Subjects</b>	<b>Credit Hours</b>	<b>Theory Marks</b>	<b>Practical Marks</b>	<b>Total Marks</b>
	<b>General Education Component:</b>				
PAPER-I	Basics of Computers	3	50	30	80
	<b>Skill Component:</b>				
PAPER-II	Analytical Techniques	3+3	50	30	80
PAPER-III	Crop Production	3+3	50	30	80
PAPER-IV	Introductory Microbiology	3+3	50	30	80
PAPER-V	Food Biotechnology	3+3	50	30	80
					<b>Total : 400</b>

**BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER SYSTEM)**

**Semester-IV**

**(Aligned with Level 6 of Sector Skill Council- Qualification Pack- Food Regulatory Affair Manager (FIC/Q9002))**

<b>PAPER</b>	<b>Subjects</b>	<b>Credit Hours</b>	<b>Theory Marks</b>	<b>Practical Marks</b>	<b>Total Marks</b>
	<b>General Education Component:</b>				
PAPER-I	*Environmental Studies (Compulsory)	3	75	25	-
PAPER-II	Environment Impact Assessment	3	100	-	100
	<b>Skill Component:</b>				
PAPER-III	Plant Pathology and Crop Disease Management	3+3	75	25	100
PAPER-IV	Food Legislation & Quality Systems	3+3	75	25	100
PAPER-V	Food Plant Layout & Sanitation	3+3	75	25	100
PAPER-VI	Industrial Training	3+3	<b>Report (Satisfactory/Unsatisfactory)</b>		
			<b>Total : 400</b>		

**\*Note : Marks will not be included in the total marks.**

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Paper-I: COMMUNICATION SKILLS IN ENGLISH-I**

**Time: 3 Hours**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**The syllabus is divided in four sections as mentioned below:**

**Section–A**

**Reading Skills:** Reading Tactics and strategies; Reading purposes–kinds of purposes and associated comprehension; Reading for direct meanings.

**Section–B**

Reading for understanding concepts, details, coherence, logical progression and meanings of phrases/ expressions.

**Activities:**

- Comprehension questions in multiple choice format
- Short comprehension questions based on content and development of ideas

**Section–C**

**Writing Skills:** Guidelines for effective writing; writing styles for application, personal letter, official/ business letter.

**Activities**

- Formatting personal and business letters.
- Organising the details in a sequential order

**Section–D**

Resume, memo, notices etc.; outline and revision.

**Activities:**

- Converting a biographical note into a sequenced resume or vice-versa
- Ordering and sub-dividing the contents while making notes.
- Writing notices for circulation/ boards

**Recommended Books:**

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *English Grammar in Use* (Fourth Edition) by Raymond Murphy, CUP

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Paper-II: ਪੰਜਾਬੀ (ਲਾਜ਼ਮੀ)**

ਸਮਾਂ : 3 ਘੰਟੇ

ਕੁਲ ਅੰਕ : 50

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿੱਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ**

**ਸੈਕਸ਼ਨ-ਏ**

ਆਤਮ ਅਨਾਤਮ (ਕਵਿਤਾ ਭਾਗ),  
(ਸੰਪ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।  
(ਪ੍ਰਸ਼ਗ ਸਾਹਿਤ ਵਿਆਖਿਆ, ਸਾਰ )

**ਸੈਕਸ਼ਨ-ਬੀ**

ਇਤਿਹਾਸਕ ਯਾਦਾਂ (ਇਤਿਹਾਸਕ ਲੇਖ-ਸੰਗ੍ਰਹਿ)  
ਸੰਪਾ. ਸ.ਸ.ਅਮੋਲ,  
ਪੰਜਾਬੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਲੁਧਿਆਣਾ। (ਲੇਖ 1 ਤੋਂ 6)  
(ਨਿਬੰਧ ਦਾ ਸਾਰ, ਲਿਖਣ-ਸ਼ੈਲੀ)

**ਸੈਕਸ਼ਨ-ਸੀ**

(ੳ) ਪੈਰਾ ਰਚਨਾ  
(ਅ) ਪੈਰਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ।

**ਸੈਕਸ਼ਨ-ਡੀ**

(ੳ) ਪੰਜਾਬੀ ਧੁਨੀ ਵਿਉਂਤ : ਉਚਾਰਨ ਅੰਗ, ਉਚਾਰਨ ਸਥਾਨ ਤੇ ਵਿਧੀਆਂ, ਸਵਰ, ਵਿਅੰਜਨ,  
ਸੁਰ-ਪ੍ਰਵਾਹ।  
(ਅ) ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ : ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ-ਭਾਸ਼ਾ ਦਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ।

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Paper-II: ਮੁੱਢਲੀ ਪੰਜਾਬੀ**  
(In lieu of Compulsory Punjabi)

ਸਮਾਂ : 3 ਘੰਟੇ

ਕੁਲ ਅੰਕ: 50

**ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ**

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਪਾਠ-ਕ੍ਰਮ**

**ਸੈਕਸ਼ਨ-ਦੇ**

ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ, ਪੈਰ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ ਅਤੇ ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ ਅਤੇ ਮਾਤ੍ਰਵਾਂ (ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ)  
ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ

**ਸੈਕਸ਼ਨ-ਬੀ**

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ  
(ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ, ਮੂਲ ਸ਼ਬਦ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ)

**ਸੈਕਸ਼ਨ-ਸੀ**

ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਰਿਸ਼ਤੇ-ਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਆਦਿ ਨਾਲ ਸੰਬੰਧਤ।

**ਸੈਕਸ਼ਨ-ਡੀ**

ਹਫ਼ਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਂ, ਇਕ ਤੋਂ ਸੌ ਤਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿਚ ।



BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Paper-II: Punjab History & Culture (From Earliest Times to C 320)**  
**(Special Paper in lieu of Punjabi compulsory)**  
**(For those students who are not domicile of Punjab)**

**Time: 3 Hours**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

1. Physical features of the Punjab and its impact on history.
2. Sources of the ancient history of Punjab

**Section B**

3. Harappan Civilization: Town planning; social, economic and religious life of the Indus Valley People.
4. The Indo-Aryans: Original home and settlements in Punjab.

**Section C**

5. Social, Religious and Economic life during *Rig Vedic Age*.
6. Social, Religious and Economic life during *Later Vedic Age*.

**Section D**

7. Teachings and impact of Buddhism
8. Jainism in the Punjab

**Suggested Readings**

1. L. M Joshi (ed.), *History and Culture of the Punjab*, Art-I, Patiala, 1989 (3<sup>rd</sup> edition)
2. L.M. Joshi and Fauja Singh (ed.), *History of Punjab*, Vol.I, Patiala 1977.
3. Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.
4. B.N. Sharma, *Life in Northern India*, Delhi. 1966.
5. Chopra, P.N., Puri, B.N., & Das, M.N.(1974). *A Social, Cultural & Economic History of India*, Vol. I, New Delhi: Macmillan India.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Paper-III: Drug Abuse: Problem, Management and Prevention  
(COMPULSORY PAPER)**

**PROBLEM OF DRUG ABUSE**

**Time: 3 Hours**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section – A**

**Meaning of Drug Abuse:**

Meaning, Nature and Extent of Drug Abuse in India and Punjab.

**Section – B**

**Consequences of Drug Abuse for:**

Individual	:	Education, Employment, Income.
Family	:	Violence.
Society	:	Crime.
Nation	:	Law and Order problem.

**Section – C**

**Management of Drug Abuse:**

Medical Management: Medication for treatment and to reduce withdrawal effects.

**Section – D**

Psychiatric Management: Counselling, Behavioural and Cognitive therapy.

Social Management: Family, Group therapy and Environmental Intervention.

**References:**

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Kessel, Neil and Henry Walton. 1982, *Alcoholism. Harmond Worth*: Penguin Books.
6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
9. Sain, Bhim 1991, *Drug Addiction Alcoholism, Smoking obscenity* New Delhi: Mittal Publications.
10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
11. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.
13. Verma, P.S. 2017, "*Punjab's Drug Problem: Contours and Characteristics*", Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
14. World Drug Report 2016, United Nations office of Drug and Crime.
15. World Drug Report 2017, United Nations office of Drug and Crime.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**PAPER-IV : Introduction to Food Science (Theory)**

**Time: 3 Hours**

**Max. Marks: 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Food science introduction and significance, Constituents of food and their importance, Nutritive aspect of food constituents .methods of cooking of foods and changes during cooking and processing. Non nutritional constituents and food safety, food adulteration.

**SECTION-B**

Cereal and legumes: Cereals grains, structure and Composition, Milling of wheat, rice and maize,

Parboiling of rice, brief introduction to baking and breakfast cereals.

Nutritive value of pulses and their processing,

Composition and nutritive value fruits and vegetables, ripening and storage, nutritional aspects of raw and processed vegetables and fruits.

**SECTION-C**

Composition and nutritive value of milk and milk products, milk processing- clarification, pasteurization and homogenization. Evaporated milk

Structure, composition, quality, nutritive value and processing of egg, meat, poultry and fish.

**SECTION-D**

Manufacture of different types of sugar (sugar, jaggery, honey, and syrup), caramelization, hydrolysis and crystallization of sugars. Ingredients of confectionery, Chocolate and Indian confectionery

Sources and processing of fats and oils. Food adjuncts- spices, condiments, herbs, food colors and flavors- classification and uses in Indian cookery.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Introduction to Food Science (PRACTICAL)**

**Time: 3 Hours**

**Max. Marks: 25**

1. To identify the food sources for various nutrients
2. Planning of diet for children, adults and old people
3. To determine physical characteristics of cereal grains
4. To study the ripening of fruits and vegetables.
5. Separation, neutralization and ripening of milk cream
6. Grading and quality evaluation of eggs.
7. To perform sampling teste of milk.
8. Preparation of caramel and candies.
9. Identification of different spices and adulteration in them.

**Recommended Books:**

1. Food Processing and Preservation- Subbulaksmi G., and Udipi S.
2. Principles of Food Science, Vol. II- G. Borgstron, Mc. Millan Co. Ltd. London.
3. Principles of food preservation Part I& II- Owen R. Fenemma.
4. Food Science- Potter, CBS publishers.
5. Technology of Food Preservation - N.W. Desroiser and N.W. Desrosier
6. Introduction to Food Science & Technology- G.P. Stewart & M.A. Amerine
7. Food Processing Operations Vol. III -M.A. Joslyn and J.J. Heild.
8. Preservation of Fruits and Vegetables- Giridhari Lal, G.S. Siddappa, and G.L. Tondon

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**PAPER-V : Crop Science (Theory)**

**Time: 3 Hours**

**Max. Marks: 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Introduction to Crop Science: importance of crop plants used as food, feed, fiber and fuel; historical significance, world population and food supply; origin, classification and geographical distribution of field crops; plant life cycle

**SECTION-B**

Growth and development of crop plants: botany of plants, anatomy, morphology, propagation- asexual and sexual and management of plant growth

**SECTION-C**

Crop environmental factors: air, light, water, temperature, soil; cropping systems and practices; crop pests: weeds and insects; agriculture in 21<sup>st</sup> century; crop breeding and improvement

**SECTION-D**

Important field crops of the world: grains, oil, fiber, sugar, drug, forage, biofuel; harvesting, storing and marketing practices

**Suggested Readings:**

1. Crop Science: Principles and Practices. R. Mullen. Pearson Custom Publishing.
2. Introduction to Plant Science. R. Parker. Delmar Cengage Learning.
3. Plant Science: Growth, Development, and Utilization of Cultivated Plants. M. McMahon, A. Kofranek, and V. Rubatzky, Pearson.
4. Principles of Field Crop Production. J. Martin, R. Waldren, and D. Stamp, Pearson.
5. Principles of Crop Production, Acquaah.
6. Introduction to Agronomy, Sheaffer & Moncada
7. Plant and Soil Science, R. Parker, Delmar Cengage Learning
8. Hand Book of Agriculture, ICAR, New Delhi.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Crop Science (Practical)**

**Time: 3 Hours**

**Max. Marks: 25**

**Note:** Paper will be set on the spot by the examiner

**Suggested Exercises:**

1. Identification of important crop plants grain, fiber, oil, sugar, drug, forage
2. Identification of important crop-seeds and weeds associated with them.
3. Anatomical sections of stem and roots of common crop species.
4. Techniques of vegetative propagation
5. Technique of emasculation and artificial pollination in important crops
6. Viability and vigour test of seed samples.
7. To record temperature, relative humidity and light intensity values of the atmosphere.
8. To study the community by quadrat method.
9. Determination of pH, EC in soil.
10. Determination of specific gravity, bulk density and soil texture.
11. Germination of dormant and non-dormant seeds.

**Suggested Readings:**

1. Principles of Crop Production, Acquah.
2. Introduction to Agronomy, Sheaffer & Moncada
3. Plant and Soil Science, R. Parker, Delmar Cengage Learning
4. Hand Book of Agriculture, ICAR, New Delhi.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**PAPER-VI : Fundamentals of Biochemistry (Theory)**

**Time: 3 Hours**

**Max. Marks: 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Biophysics of water: Molecular structure of water, hydrogen Bond and physical properties of water.

Biomolecules: Structure, function, diversity and distribution, cell wall structure and general introduction of living matter

**SECTION-B**

Carbohydrates: Structure of important mono,di,oligo and polysaccharides, Glycoproteins and Peptidoglycans, glycolipids and lipopolysaccharides

Proteins: Structure of amino acids, non-protein and rare amino acids and their chemical reactions. Structural organization of proteins (Primary, Secondary, Quaternary and domain structure, protein classification and function.

Forces stabilizing Primary, Secondary and Tertiary structure.

**SECTION-C**

Lipids: Classification of lipids and fatty acids. General structure and function of major lipid subclasses, acylglycerols, phosphoglycerides, Sphingolipids, glycosphingolipid.

**SECTION-D**

Nucleic Acids: Structure of nucleosides and nucleic acids, biologically important nucleotides and their functions. Different types of DNA & RNA.

Introduce to enzymes: Proteinaceous nature, co-enzymes, isozymes, ribozymes, classification, active site, Michalis Menten equation.



BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Books Recommended:**

1. Rawn, J.D. (1989). Biochemistry, Neil Patterson Publishers
2. Zubay, G.L., Parson. W.W. and Vance, D.E. (1995). Principles of Biochemistry: Student Study Art Notebook, Wm. C. Brown Publishers.
3. Bucke C., (1999)), Carbohydrate Biotechnology Protocols, Humara Press.
4. Horton et. al., (2001), Principles of Biochemistry, Prentice Hall.
5. Lehninger, A.L., Nelson, D.L. and Lox, M.M. (2005). Principles of Biochemistry 4 Ed., CBS Publishers and Distributors, New Delhi.
6. Stryer, L. (1995). Biochemistry: 4th Edition, W.H. Freeman and Company,

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Fundamentals of Biochemistry (PRACTICAL)**

**Time: 3 Hours**

**Max. Marks: 25**

1. Preparation of physiological buffers.
2. Verification of Beer Lamberts Law for P-nitrophenol or cobalt chloride.
3. Determination of pKa value of P-nitrophenol
4. Estimation of carbohydrate in given solution by anthrone method.
5. Estimation of sugar in biological samples by dubois method.
6. The determination of acid value of a fat.
7. The saponification value of a fat

**Books Recommended:**

1. Plummer D.T. (1990) An Introduction of Practical Biochemistry. 3rd Ed.  
Tata McGraw Hill Publishers Co. Ltd., New Delhi.
2. Bansal, D.D., Khardori, R. & Gupta, M.M. (1985) Practical Biochemistry.  
Standard Publication, Chandigarh.
3. Sawhney, S.K. and Randhir singh (2001). Introductory Practical Biochemistry,  
Narosa Publishing House.
6. Lehninger, A.L., Nelson, D.L. and Lox, M.M. (2005).  
Principles of Biochemistry 4th Ed., CBS Publishers and Distributors, New Delhi.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-I)

**Industrial Training**

A Two Week Industrial Training is mandatory for completion of the Course. Result would be declared as Satisfactory or Unsatisfactory completion of the Industrial Training Program.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**PAPER-I: COMMUNICATION SKILLS IN ENGLISH-II**

**Time: 3 Hours**

**Max. Marks: 50**  
**Theory Marks: 35**  
**Practical Marks: 15**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Course Contents:**

**SECTION-A**

**Listening Skills:** Barriers to listening; effective listening skills; feedback skills.

**Activities:** Listening exercises – Listening to conversation, News and TV reports

**SECTION-B**

Attending telephone calls; note taking and note making.

**Activities:** Taking notes on a speech/lecture

**SECTION-C**

**Speaking and Conversational Skills:** Components of a meaningful and easy conversation; understanding the cue and making appropriate responses; forms of polite speech; asking and providing information on general topics.

**Activities:**

- 1) Making conversation and taking turns
- 2) Oral description or explanation of a common object, situation or concept

**SECTION-D**

The study of sounds of English,  
Stress and Intonation,  
Situation based Conversation in English,  
Essentials of Spoken English.

**Activities:** Giving Interviews

**PRACTICAL / ORAL TESTING**

**Marks: 15**

**Course Contents:-**

1. Oral Presentation with/without audio visual aids.
2. Group Discussion.
3. Listening to any recorded or live material and asking oral questions for listening comprehension.

**Questions:-**

1. Oral Presentation will be of 5 to 10 minutes duration (Topic can be given in advance or it can be student's own choice). Use of audio visual aids is desirable.
2. Group discussion comprising 8 to 10 students on a familiar topic. Time for each group will be 15 to 20 minutes.

**Note:** Oral test will be conducted by external examiner with the help of internal examiner.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Paper-II: ਪੰਜਾਬੀ (ਲਾਜ਼ਮੀ)**

ਸਮਾਂ : 3 ਘੰਟੇ

ਕੁਲ ਅੰਕ : 50

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿੱਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ

**ਸੈਕਸ਼ਨ-ਏ**

ਆਤਮ ਅਨਾਤਮ (ਕਹਾਣੀ ਭਾਗ),  
(ਸੰਪ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ)  
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।  
(ਵਿਸ਼ਾ-ਵਸਤੂ, ਪਾਤਰ ਚਿਤਰਨ)

**ਸੈਕਸ਼ਨ-ਬੀ**

ਇਤਿਹਾਸਕ ਯਾਦਾਂ (ਇਤਿਹਾਸਕ ਲੇਖ-ਸੰਗ੍ਰਹਿ)  
ਸੰਪਾ. ਸ.ਸ.ਅਮੋਲ,  
ਪੰਜਾਬੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਲੁਧਿਆਣਾ। (ਲੇਖ 7 ਤੋਂ 12)  
(ਸਾਰ, ਲਿਖਣ ਸ਼ੈਲੀ)

**ਸੈਕਸ਼ਨ-ਸੀ**

(ੳ) ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ ਰਚਨਾ : ਪਰਿਭਾਸ਼ਾ, ਮੁੱਢਲੇ ਸੰਕਲਪ  
(ਅ) ਸ਼ਬਦ ਸੂਚੀ

**ਸੈਕਸ਼ਨ-ਡੀ**

(ੳ) ਸੰਖੇਪ ਰਚਨਾ  
(ਅ) ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Paper-II: ਮੁੱਢਲੀ ਪੰਜਾਬੀ**  
(In lieu of Compulsory Punjabi)

ਸਮਾਂ: 3 ਘੰਟੇ

ਕੁਲ ਅੰਕ: 50

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

**ਪਾਠ-ਕ੍ਰਮ**

**ਸੈਕਸ਼ਨ-ਏ**

ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ  
(ਨਾਂਵ, ਪੜਨਾਂਵ, ਕਿਰਿਆ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸਬੰਧਕ, ਯੋਜਕ ਅਤੇ ਵਿਸਮਿਕ)

**ਸੈਕਸ਼ਨ-ਬੀ**

ਪੰਜਾਬੀ ਵਾਕ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ  
(ੳ) ਸਾਧਾਰਨ ਵਾਕ, ਸੰਯੁਕਤ ਵਾਕ ਅਤੇ ਮਿਸ਼ਰਤ ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)  
(ਅ) ਬਿਆਨੀਆ ਵਾਕ, ਪ੍ਰਸ਼ਨਵਾਚਕ ਵਾਕ ਅਤੇ ਹੁਕਮੀ ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

**ਸੈਕਸ਼ਨ-ਸੀ**

ਪੈਰ੍ਹਾ ਰਚਨਾ  
ਸੰਖਿਪ ਰਚਨਾ

**ਸੈਕਸ਼ਨ-ਡੀ**

ਚਿੱਠੀ ਪੱਤਰ (ਘਰੇਲੂ ਅਤੇ ਦਫ਼ਤਰੀ)  
ਅਖਾਣ ਅਤੇ ਮੁਹਾਵਰੇ

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Paper-II: Punjab History & Culture (C 320 to 1000 B.C.)**  
**(Special Paper in lieu of Punjabi compulsory)**  
**(For those students who are not domicile of Punjab)**

**Time: 3 Hours**

**Max. Marks : 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section A**

1. Alexander's Invasion and its Impact
2. Punjab under Chandragupta Maurya and Ashoka.

**Section B**

3. The Kushans and their Contribution to the Punjab.
4. The Panjab under the Gupta Empire.

**Section C**

5. The Punjab under the Vardhana Emperors
6. Socio-cultural History of Punjab from 7<sup>th</sup> to 1000 A.D.

**Section D**

7. Development of languages and Education with Special reference to Taxila
8. Development of Art & Architecture

**Suggested Readings**

1. L. M Joshi (ed), *History and Culture of the Punjab*, Art-I, Punjabi University, Patiala, 1989 (3<sup>rd</sup> edition)
2. L.M. Joshi and Fauja Singh (ed.), *History of Punjab* , Vol.I, Punjabi University, Patiala, 1977.
3. Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.
4. B.N. Sharma: *Life in Northern India*, Delhi. 1966.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Paper-III: Drug Abuse: Problem, Management and Prevention  
(COMPULSORY PAPER)**

**DRUG ABUSE: MANAGEMENT AND PREVENTION**

**Time: 3 Hours**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**Section – A**

**Prevention of Drug abuse:**

Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.

**Section – B**

School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

**Section – C**

**Controlling Drug Abuse:**

Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program

**Section – D**

Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

**References:**

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Kessel, Neil and Henry Walton. 1982, *Alcoholism*. Harmond Worth: Penguin Books.
6. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.



BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

7. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
8. Ross Coomber and Others. 2013, *Key Concept in Drugs and Society*. New Delhi: Sage Publications.
9. Sain, Bhim 1991, *Drug Addiction Alcoholism, Smoking obscenity* New Delhi: Mittal Publications.
10. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
11. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
12. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.
13. Verma, P.S. 2017, "*Punjab's Drug Problem: Contours and Characteristics*", Economic and Political Weekly, Vol. LII, No. 3, P.P. 40-43.
14. World Drug Report 2016, United Nations office of Drug and Crime.
15. World Drug Report 2017, United Nations office of Drug and Crime.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**PAPER-IV : Fundamentals of Genetics (Theory)**

**Time: 3 Hours**

**Max. Marks: 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

**Organization of Chromosomes:** Genome size and complexity, the supercoiling of DNA, euchromatin and heterochromatin, satellite DNA. The structure of prokaryotic and eukaryotic chromosomes, Polytene and Lamp-Brush chromosomes.

**SECTION-B**

**Mendel's Laws of Inheritance:** Principle of segregation and Independent assortment, Monohybrid, dihybrid and trihybrid crosses, Back cross and test cross.

**Interaction of Genes:** Incomplete inheritance and co-dominance, pleiotropism, modification of F<sub>2</sub> ratios: epistasis, complementary genes, supplementary genes, inhibitory genes, duplicate genes, lethality and collaborators genes. Multiple allelism.

**SECTION-C**

**Linkage:** Coupling and repulsion hypothesis, chromosomal theory of linkage, complete and incomplete linkage, linkage groups and significance of linkage. Tetrad analysis in fungi.

**Crossing Over:** Introduction, molecular mechanism of meiotic crossing over, types of crossing over, factors affecting it and its significance.

**SECTION-D**

**Mutation:** Spontaneous versus induced mutations, types of mutations, mutations rate and frequency, Mutagens: Physical and Chemical, the molecular basis of mutations. Significance & Practical applications of Mutation

**Basic Microbial Genetics:** Conjugation, transduction, transformation

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Fundamentals of Genetics (Practical)**

**Time: 3 Hours**

**Max. Marks: 25**

**Note:** Paper will be set on the spot by the examiner

**Suggested Exercises:**

1. Demonstration of Law of segregation and Independent assortment (use of coloured beads, capsules etc.).
2. Numerical problems on Mendelism and on modified F<sub>2</sub> ratios.
3. Numerical problems on Paternity disputes (Blood groups).
4. Testing of blood groups and Rh factors in human beings.
5. Study of polytene chromosomes from permanent slides.
6. Dermatographics : Palm print taking and finger tip patterns.
7. Preparation and study of mitosis slides from onion root tips by squash method.

**Suggested Readings:**

1. Maloy, S.R., Crown, J.E. and Freifelder, D. (1994). Microbial Genetics: 2nd Edition, Jones & Bartlett Publishers.
2. Hartl, D.L. (1994). Genetics: 3rd Edition, Jones & Bartlett Publishers.
3. Brooker, R.J. (1999). Genetics: Analysis and Principles, Jim Green.
4. Antherly A.G., Girton. J.R. (1999), The Science of Genetics. Harcourt college Publishers
5. Freifelder, D. (2000). Microbial Genetics, Narosa Publishing House.
6. Hartl. D.L., Jones E.W., (2001). Genetics: Analysis of Genes & Genomes 5th Edition. Jones & Bartlett Publishers.
7. Gupta PK (2007) Genetics, Rastogi Publications
8. Snustad and Simmons (2010) Principles of Genetics: 5th Edition, John Wiley & sons.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**PAPER-V : Food Processing (Theory)**

**Time: 3 Hours**

**Max. Marks: 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Introduction, sources of food, scope and benefit of industrial food preservation, perishable and non-perishable food, causes of food spoilage. Deteriorative factors of foods, Unit operations in food industry, quality factors of foods Principle and methods of Preservation by salt and sugar and chemicals

**SECTION-B**

Thermal processing methods of preservation – blanching, pasteurization, sterilization and canning Food dehydration and evaporation -Principle, Methods, equipments used.

**SECTION-C**

Cold preservation and processing– cold storage, refrigeration and freezing .  
Fermentation as food preservation –methods and products.

**SECTION-D**

Definition and methods of food irradiation, direct and indirect effect, measurement of radiation dose, effect on microorganisms and quality of foods. Microwave heating and applications in foods, Recent methods in preservation: Pulsed electric field processing, High pressure processing, Processing using ultrasound, dielectric, Ohmic and infrared heating.

**Recommended Books:**

1. Food Processing and Preservation- Subbulaksmi G., and Udipi S.
2. Principles of Food Science, Vol. II- G. Borgstron, Mc. Millan Co. Ltd. London.
3. Principles of food preservation Part I& II- Owen R. Fenemma.
4. Food Science- Potter, CBS publishers.
5. Technology of Food Preservation - N.W. Desroiser and N.W. Desrosier
6. Introduction to Food Science & Technology- G.P. Stewart & M.A. Amerine
7. Food Processing Operations Vol. III -M.A. Joslyn and J.J. Heild.
8. Preservation of Fruits and Vegetables- Giridhari Lal, G.S. Siddappa, and G.L. Tondon 19-31-31 FPT-116:

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Food Processing (Practical)**

**Time: 3 Hours**

**Max. Marks: 25**

**Note:** Paper will be set on the spot by the examiner

1. Demonstration of various machineries used in food processing.
2. Demonstration on effect of blanching on quality of foods.
3. Demonstration on canning and bottling of fruits and vegetables.
4. Preservation of food by concentration method
5. Preservation of food by using chemicals.
6. Drying of foods in tray drier
7. Osmotic dehydration of foods .
8. Preservation of milk by concentration.
9. Demonstration of preserving foods under low temperature.
10. Preservation of food by fermentation .
11. Cut out analysis of canned product.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**PAPER-VI : Crop Physiology (Theory)**

**Time: 3 Hours**

**Max. Marks: 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

**Plant-Water Relations:** Role and significance of water- diffusion, imbibition, osmosis and its significance, plasmolysis, definitions - field capacity, water holding capacity of soil and permanent wilting point, absorption of water - mode of water absorption – active and passive absorption and factors affecting absorption, translocation of solutes - phloem and xylem transport, transpiration - types – mechanism of stomatal opening closing, significance, factors affecting transpiration and guttation – antitranspirants.

**SECTION-B**

**Mineral Nutrition:** Introduction- criteria of essentiality of elements - macro, secondary and micronutrients - sand and soil less culture- hydroponics, Mechanism of uptake - physiological role of nutrients, deficiency and toxicity symptoms (hydroponics).

**SECTION-C**

**Photosynthesis:** Significance, historical aspects, photosynthetic pigments, action and absorption spectra and enhancement effects, concept of two photosystems, z-scheme, photophosphorylation, Calvin, cycle, C4 pathway, CAM plants, photorespiration, factors affecting photosynthesis.

**Respiration:** Glycolysis, TCA, electron transport mechanism (chemi-osmotic theory) and Pentose Phosphate Pathway, oxidative phosphorylation, respiratory quotient and energy budgeting in respiration

**SECTION-D**

**Growth and Development:** Definitions, phases of growth and development, kinetics of growth, seed dormancy, seed germination and factors of their regulation, plant movements, the concept of photoperiodism, physiology of flowering, vernalization-devernalization, physiology of senescence, abscission, fruit ripening, plant hormones - auxins, gibberellins, cytokinins, abscissic acid and ethylene, history of their discovery, biosynthesis, mechanism of action and their practical application in crop productivity.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Suggested Readings:**

1. Dennis, D.T., Turpin, D.H. Lefebvre, D.D. and Layzell (eds.) 1997. Plant Metabolism (2<sup>nd</sup> Edition). Longman, Essex, England.
2. Galston, A.W. 1989. Life Processes in Plants. Scientific American Library, Springer-Verlag, New York, USA.
3. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology (4th Edition). John Wiley and Sons. U.S.A.
4. Mandavia, C., Patel, S. V., Mandavia, M. K., Golakiya, B. A. and Chovatia, V. P. (2009). Glimpses in Plant Physiology. International Book Distributing Co., Lucknow, India.
5. Mohr, H. and Schopfer, P. 1995. Plant Physiology. Springer-Verlag, Berlin, Germany.
6. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th Edition). Wadsworth Publishing Co., California, USA.
7. Taiz, L. and Zeiger, E. (2010). Plant Physiology (5th Edition). Sinauer Associates Inc. USA..
8. Buchanan, B.B., Gruissem, W. and Jones, R.L.(2002). Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists, Maryland.
9. Bhojwani, S.S. (1990). Plant Tissue Culture: Applications and Limitations. Elsevier Science Publishers, New York, USA.
10. Dennis, D.T., Turpin, D.H. Lefebvre, D.D. and Layzell (eds.) (1997). Plant Metabolism (2<sup>nd</sup> Edition). Longman, Essex, England.
11. Galston, A.W. (1989). Life Processes in Plants. Scientific American Library, Springer-Verlag, New York, USA.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Crop Physiology (Practical)**

**Time: 3 Hours**

**Max. Marks: 25**

**Note:** Paper will be set on the spot by the examiner

**Suggested Laboratory Exercises:**

1. To study the permeability of plasma membrane using different concentrations of organic solvents.
2. To study the effects of temperature on permeability of plasma membrane.
3. To prepare the standard curve of protein and determine the protein content in unknown samples.
4. Separation of chloroplast pigments by solvent method.
5. Determining the osmotic potential of vacuolar sap by plasmolytic method.
6. Determining the water potential of any tuber.
7. Bioassay of auxin, cytokinin, GA, ABA and ethylene using appropriate plant material.
8. Demonstrate the ascent of sap using a dye.
9. Demonstrate the transpiration pull by mercury method.
10. Demonstration of osmosis by potato osmoscope.
11. Comparison of loss of water from two surfaces of leaf by  $\text{CoCl}_2$  method/four leaf method.
12. Demonstration of imbibition by plaster of paris method.
13. Demonstration that  $\text{O}_2$  is evolved during photosynthesis.
14. Separation of pigments by paper chromatography/TLC method.
15. Demonstration of phototropism movements.
16. Demonstration the measurements of growth by arc auxanometer.

**Suggested Readings (For Laboratory Exercises)**

1. Bajracharya D. (1999). Experiments in Plant Physiology-A Laboratory Manual. Narosa Publishing House, New Delhi.
2. Devi, P. 2000. Principles and Methods of Plant Molecular Biology, Biochemistry and Genetics. Agrobios, Jodhpur, India.
3. Dixon, R.A. (Ed.) 1987. Plant Cell Culture: A Practical Approach, IRL Press, Oxford.
4. Kochhar, S. L. and Gujral, S. K. (2012). Comprehensive Practical Plant Physiology. Macmillan Publishers India Ltd., Delhi.
5. Moore, T.C. 1974. Research Experiences in Plant Physiology: A Laboratory annual. Springer- Verlag. Berlin.
6. Plummer, D.T. (1996). An Introduction to Practical Biochemistry (3rd Edition). Tata McGraw- Hill Publishing Co. Ltd. New Delhi.
7. Roberts, J. and Tuckar, G.A. (Eds.) 2000. Plant Hormone Protocols. Human Press, New Jersey, USA.
8. Scott, R.P.W. 1995. Techniques and Practices of Chromotography. Marcel Dekker, Inc., New York.
9. Smith, R.H. 2000. Plant Tissue Culture: Techniques and Experiments. Academic Press, New York.
10. Wilson, K. and Goulding, K.H. (Eds.) 1986. A Biologists Guide to Principles and Techniques of Practical Biochemistry. Edward Arnold, London, UK.



BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-II)

**Industrial Training**

A Two Week Industrial Training is mandatory for completion of the Course. Result would be declared as Satisfactory or Unsatisfactory completion of the Industrial Training Program.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-I : Basics of Computers**  
(Theory)

**Time: 3 Hrs.**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

**FUNDAMENTAL OF COMPUTER :** Introduction to computer, Applications of computer. Components of computer. Primary and Secondary storage. Number systems.

**SECTION-B**

**INTRODUCTION TO WINDOWS :** Parts of window screen (Desktop, Window, Icons), Start menu, Taskbar, settings, application & document window, anatomy of a window (Title bar, minimize, maximize button, control box, scroll bars, scroll buttons, scroll boxes), Window explorer (expansion, collapsing of directory tree, copying, moving, deleting files, folder, creating folders), About desktop icons (recycle bin, my computer, network neighborhood, briefcase ), folder, shortcut creation, setting of screen saver, color settings , wallpaper, changing window appearance.

**SECTION-C**

**MS-WORD :** Introduction to MS-word, Parts of window of word (Title bar, menu bar, status bar, ruler), Creation of new document, opening document, insert a document into another document. Page setup, margins, gutters, font properties, Alignment, page breaks, header, footer, deleting, moving replace, a filing text in document. Saving a document, spell checker, printing a document, creating a table, entering editing text in tables, changing format of table, height width of row or column Editing, deleting, rows, Columns in table. Borders, shading, Templates, Wizards Drawing objects, mail merge.

**SECTION-D**

**MS-POWER POINT :** Introduction, elements of Power Point Package, starting Power Point, Exploring Power Point menus, starting a new slide, Adding Titles, Text and Art, Moving text area and resizing text box starting a slide show, saving a presentation, printing slides, opening an existing presentation, Inserting and deleting slides in a presentation, changing text and correcting error, checking spelling, adding header and footer, closing a presentation, To quit from Power Point views, slide setup, setting up slide show, setting transitions and slide timings, Automatic slide show, Formatting and Enhancing text, Slide with graph.

**Book Recommended:**

PC Software by Rachhpal Singh & Gurinder Singh.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-I : Basics of Computers  
(Practical)**

**Max. Marks: 30**

**Instructions for the Paper Setters: Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.**

**WINDOW-95:**

1. Change the Background of the Desktop and also set the screen saver.
2. Create a Folder RAMAN and also create a Folder MOHAN with in the RAMAN folder.
3. Create a short cut of MS-Word on the desktop.
4. Delete some files from the MOHAN folder and also recall these files from the Recycle Bin. Empty the remaining recycle bin.
5. Copy some files from the C drive to floppy drive A using the Windows Explorer facility.

**MS-WORD:**

1. Create a document files, save it and print it.
2. Spell check the created document file.
3. Create a Table and sort the data within the table.
4. Mail Merge a invitation to your friends.
5. Apply border to a particular paragraph and shade it 10% with Background yellow colour.

**MS-POWER POINT:**

1. Create a presentation, save it and print it.
2. Format a presentation with changing the fonts and size and selecting text style and colours.
3. Create a graph ; add titles, axes and legends to a graph.
4. Add a Clipart picture to a chart.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-II : ANALYTICAL TECHNIQUES**  
**(Theory)**

**Time: 3 Hrs.**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Brief introduction and principles: Spectroscopic techniques using UV/Visible, polarimetry, refractometry, microscopic techniques in food analysis (light microscopy).

**SECTION-B**

Electron microscopy: principle and brief introduction to types of electron microscopy (SEM, TEM): application of electron microscopy in food processing

**SECTION-C**

Principle and working of Column chromatography, Gas chromatography and High Pressure Liquid Chromatography. Brief introduction and principles to Separation techniques: ultrafiltration and supercritical fluid extraction.

**SECTION-D**

Brief introduction and principles to Special techniques: surface tension; thermal methods in food analysis (Differential scanning calorimetry). Texture analyzer, rheometer, hunterlab, amylograph and farinograph, calorimeter.

**Recommended Books:**

1. AOAC International. 2003. *Official methods of analysis of AOAC International*. 17th Ed. Gaithersburg, MD, USA, Association of Analytical Communities.
2. Kirk RS & Sawyer R. 1991. *Pearson's Chemical Analysis of Foods*. 9th Ed. Longman Scientific & Technical.
3. Nielsen S. (Eds.). 1994. *Introduction to Chemical Analysis of Foods*. Jones & Bartlett.
4. Pomrenz Y & Meloan CE. 1996. *Food Analysis - Theory and Practice*. 3<sup>rd</sup> Ed. CBS.
5. Ranganna S. 2001. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. 2nd Ed. Tata-McGraw-Hill.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-II : ANALYTICAL TECHNIQUES**  
**(Practical)**

**Marks: 30**

**Instructions for the Paper Setters: Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.**

1. Sorption isotherms by measuring water activity in any hygroscopic food material (for instance - biscuits/potato chips/coffee powder).
2. Estimation of tannin/phytic acid/ pigments by spectrometric method.
3. Estimation of calorific values using calorimeter
4. Separation of amino acids/coal tar dyes by two dimensional paper chromatography.
5. Separation and identification of carotenoids by column chromatography.
6. Analysis of dietary fibre/glucose by enzymatic method.
7. Demonstration of instruments: GLC, HPLC, Atomic absorption, Flame photometer, Farinograph, UV-Vis spectrophotometer and microscopes.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-III : Crop Production  
(Theory)**

**Time: 3 Hours**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Introduction to agriculture and crops production, history of agriculture, overview of crop production in India with special reference to Punjab, agro-ecological zones in India.

**SECTION-B**

Factors affecting crop growth and production; genetic and environmental factors, crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices.

**SECTION-C**

Regional and seasonal selection of crops; kharif, rabi and zaid crops; their cultivation practices and management, precision agriculture, field preparations of crops including tillage, selection and treatment of seeds and nursery growing.

**SECTION-D**

Crop water and nutrition management- need for supplementation of nutrients to soil, methods and timing of application including fertigation schedule, crop protection including weed management, pests and pathogens, methods of crop harvest, crop production field to market.

**Books recommended**

1. Martin, JD, Leonard, WH, Stamp, Waldren. Principles of field crop production 4<sup>th</sup> edition, Pearson, 2005.
2. Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2015.
3. Reddy T. Sankara G.H. Yellamanda Reddi, Principles of Agronomy, Kalyani Publishers, New Delhi, 2005.
4. Handbook of Agriculture. ICAR Publications, New Delhi, 2011.
5. Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications, New Delhi. 1989.
6. Reynolds M.(Ed) Climate Change and crop production, CABI Publishing, UK, 2010.
7. Zhang Q. (ed.) Precision agriculture technology for crop farming. Apple Academic Press, Canad

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-III : Crop Production  
(Practical)**

**Time: 3 Hours**

**Max. Marks: 30**

**Instructions for the Paper Setter-Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.**

1. Identification of major cereal and vegetable crops.
2. Determination of soil bulk density and porosity.
3. Determination of soil pH and temperature.
4. Methods of application of herbicides in different field crops.
5. Judging of physiological maturity in different crops and working out harvest index.
6. Working out cost of cultivation of different crops
7. Installation of drip irrigation systems in fields.
8. Rice nursery preparation, transplanting rice.
9. Study of seed production techniques in various crops
10. Identification of important weeds of different crops
11. Visit to nearby villages for identification of constraints in crop production

**Books recommended:**

1. Chidda Singh, Prem Singh and Rajbir Singh. Modern technique of raising field crops. 2<sup>nd</sup> Edition. Oxford and IBH publishing 2018.
2. Agronomy of field crop by S.R. Reddy
3. Hand book of Agriculture, ICAR New Delhi.
4. Aldrich, R.J. and Kramer R.J. Principles in Weed Management. 1997.
5. Gupta O.P. Weed management Principles and Practices. 2007.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-IV : INTRODUCTORY MICROBIOLOGY**  
**(Theory)**

**Time: 3 Hrs.**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

**Introduction :** Discovery of microbial world, theory of spontaneous generation, Germ theory of disease, Koch's postulates, Pure culture concept, Nature and properties of prokaryotic and eukaryotic micro-organisms.

**Microscopy:** Light microscope – Resolving power, Magnification, Bright field, Dark field, Electron microscopy–Transmission Electron microscope, Scanning electron microscope.

**SECTION-B**

**General characteristics and Nutritional requirements:** General characteristics of bacteria, yeast, mold, viruses, algae. Types of bacteria, Nutritional classification of bacteria.

**Reproduction of micro-organisms:** Brief account of bacteria, yeast and mold reproduction.

**SECTION-C**

**Microbial Growth :** Definition of growth, growth cycle, growth rate, generation time, measurement of growth, effect of environmental factors such as temperature, oxygen, moisture, salt, pH, oxidation- reduction potential and radiations on growth.

**SECTION-D**

**Control of Micro organisms:** Control of micro organisms by physical, chemical and other chemotherapeutic agents.

**Books Recommended:**

1. Microbiology by Pelczar M.J., Chan E.C.S. & Kreig N.R., 5th Ed., 1987. McGraw Hill Co, Singapore.
2. General Microbiology by Stanier R.Y., Ingraham J.L., Wheelis M.L. & Painter P.R. 5th Ed. 1993, The Macmillan Press Ltd., London.
3. Microbiology: A Laboratory Manual by Cappuccino J.G. & Sherman N., 2004. Benjamin-Cummings Publishing Co., USA.
4. Laboratory Manual in Microbiology by Gunase Karan P, 1996, New Age International (P) Ltd., New Delhi.



BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-IV : INTRODUCTORY MICROBIOLOGY**  
**(Practical)**

**Marks: 30**

**Instructions for the Paper Setters: Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.**

1. To study different parts of a microscope.
2. Study of instruments (Autoclave, Hot air oven, Incubator, Laminar flow, pH meter, and spectrophotometer) of microbiology laboratory.
3. Preparation of nutrient agar and MacConkey's Agar plates, slants and broth.
4. To study the serial dilution method.
5. To perform pour plate, spread plate and streak plate methods for isolation and enumeration of micro-organisms.
6. To demonstrate acid fast staining.
7. To stain the given bacteria by Gram's staining method.
8. To measure the size of given micro-organisms by ocular and stage micrometer.
9. To determine the number of micro-organisms with a Haemocytometer.
10. To determine the motility of bacteria by hanging drop method.

**Books Recommended:**

1. Microbiology by Pelczar M.J., Chan E.C.S. & Kreig N.R., 5th Ed., 1987. McGraw Hill Co, Singapore.
2. General Microbiology by Stanier R.Y., Ingraham J.L., Wheelis M.L. & Painter P.R. 5th Ed. 1993, The Macmillan Press Ltd., London.
3. Microbiology: A Laboratory Manual by Cappuccino J.G. & Sherman N., 2004. Benjamin-Cummings Publishing Co., USA.
4. Laboratory Manual in Microbiology by Gunase Karan P, 1996, New Age International (P) Ltd., New Delhi.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-V : FOOD BIOTECHNOLOGY**  
**(Theory)**

**Time: 3 Hrs.**

**Max. Marks: 50**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

**Introduction:** Components of Molecular Biotechnology, Recombinant DNA Technology, Restriction Endonucleases, Cloning Vectors, Polymerase Chain Reaction

**SECTION-B**

**Applications of Food Biotechnology:** Plant Biotechnology for Food Production, Improvement of Plant Nutritional and Functional Quality, Plant Proteins, Lipids, Saturated Fatty Acids, Unsaturated Fatty Acids, Carbohydrates, Plant Vaccines, Milk Proteins

**SECTION-C**

Reconstitution of Human Milk Proteins in Food Plants, Carotenoids, Vitamins, Minerals, Manipulation of Fruit Ripening,

**SECTION-D**

Genetically modified crops for food production, Future trend of GM crops, Food ingredients, processing aids, dietary supplements derived from GM microorganisms, Risk of GMOs and GM Foods to Human Health and Environment

**RECOMMENDED BOOKS:**

1. Lopez G.F.G and Canovas G.V.B. Food Science and Food biotechnology CRC press
2. [Fundamentals of Food Biotechnology](#) by Byong H. Lee: Wiley VCH
3. Tripathy S. N. Food Biotechnology Dominant Publishers and distributors ND
4. Singh R.P. Biotechnology Central Book depot Allahabad

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-III)

**PAPER-V : FOOD BIOTECHNOLOGY**  
**(Practical)**

**Max. Marks: 30**

**Instructions for the Paper Setters: Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.**

1. Isolation of DNA from micro-organisms.
2. Isolation of DNA from fruits and vegetables.
3. Colorimetric estimation of DNA.
4. Colorimetric estimation of RNA.
5. Demonstration of PCR.
6. Demonstration of tissue culturing in Lab.
7. Digestion of DNA by Restriction Endonucleases.
8. Making & Selection of competent E. coli.
9. Demonstration of ELISA.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-I : ESL-221 : Environmental Studies (Compulsory Paper)**

**Time: 3 Hrs.**

**Max. Marks: 100**

**Teaching Methodologies**

The Core Module Syllabus for Environmental Studies includes class room teaching and field work. The syllabus is divided into 8 Units [Unit-1 to Unit-VII] covering 45 lectures + 5 hours for field work [Unit-VIII]. The first 7 Units will cover 45 lectures which are class room based to enhance knowledge skills and attitude to environment. Unit-VIII comprises of 5 hours field work to be submitted by each candidate to the Teacher in-charge for evaluation latest by 15 December, 2018.

**Exam Pattern:**           **End Semester Examination- 75 marks**  
                                  **Project Report/Field Study- 25 marks [based on submitted report]**  
                                  **Total Marks- 100**

The structure of the question paper being:

**Part-A, Short answer pattern with inbuilt choice – 25 marks**

Attempt any five questions out of seven distributed equally from Unit-1 to Unit-VII. Each question carries 5 marks. Answer to each question should not exceed 2 pages.

**Part-B, Essay type with inbuilt choice – 50 marks**

Attempt any five questions out of eight distributed equally from Unit-1 to Unit-VII. Each question carries 10 marks. Answer to each question should not exceed 5 pages.

**Project Report / Internal Assessment:**

**Part-C, Field work – 25 marks [Field work equal to 5 lecture hours]**

The candidate will submit a hand written field work report showing photographs, sketches, observations, perspective of any topic related to Environment or Ecosystem. The exhaustive list for project report/area of study are given just for reference:

1. Visit to a local area to document environmental assets: River / Forest/ Grassland / Hill / Mountain / Water body / Pond / Lake / Solid Waste Disposal / Water Treatment Plant / Wastewater Treatment Facility etc.
2. Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
3. Study of common plants, insects, birds
4. Study of tree in your areas with their botanical names and soil types
5. Study of birds and their nesting habits
6. Study of local pond in terms of wastewater inflow and water quality
7. Study of industrial units in your area. Name of industry, type of industry, Size (Large, Medium or small scale)
8. Study of common disease in the village and basic data from community health centre
9. Adopt any five young plants and photograph its growth
10. Analyze the Total dissolved solids of ground water samples in your area.
11. Study of Particulate Matter (PM<sub>2.5</sub> or PM<sub>10</sub>) data from Sameer website. Download from Play store.
12. Perspective on any field on Environmental Studies with secondary data taken from Central Pollution Control Board, State Pollution Control Board, State Science & Technology Council etc.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**Unit-I**

**The multidisciplinary nature of environmental studies**

Definition, scope and importance, Need for public awareness

(2 lectures)

**Unit-II**

**Natural Resources: Renewable and non-renewable resources:**

Natural resources and associated problems.

- (a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
  - Role of an individual in conservation of natural resources.
  - Equitable use of resources for sustainable lifestyles.

(8 Lectures)

**Unit-III**

**Ecosystems**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

(6 Lectures)

**Unit-IV**

**Biodiversity and its conservation**

- Introduction – Definition: genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

(8 Lectures)

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**Unit-V**

**Environmental Pollution**

Definition

- Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

**(8 Lectures)**

**Unit-VI**

**Social Issues and the Environment**

- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Protection Act, 1986
- Air (Prevention and Control of Pollution) Act, 1981
- Water (Prevention and control of Pollution) Act, 1974
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

**(7 Lectures)**

**Unit-VII**

**Human Population and the Environment**

- Population growth, variation among nations
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

**(6 Lectures)**

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**Unit-VIII**

**Field Work**

- Visit to a local area to document environmental assets  
river/forest/grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-pond, river, hill slopes, etc

**(Field work equal to 5 lecture hours)**

**References:**

1. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
2. Down to Earth, Centre for Science and Environment, New Delhi.
3. Heywood, V.H. & Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
4. Joseph, K. & Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
5. Kaushik, A. & Kaushik, C.P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
6. Rajagopalan, R. 2011. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
7. Sharma, J. P., Sharma. N.K. & Yadav, N.S. 2005. Comprehensive Environmental Studies, Laxmi Publications, New Delhi.
8. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publications, Meerut.
9. State of India's Environment 2018 by Centre for Sciences and Environment, New Delhi
10. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-II : Environment Impact Assessment (Theory)**

**Time: 3 Hours**

**Max. Marks: 100**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Sustainable development- need for Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS) and EIA capability and limitations, legal provisions on EIA, Stages of EIA, types of EIA.

**SECTION-B**

Methods of EIA, check lists, matrices, networks, cost-benefit analysis, analysis of alternatives.

**SECTION-C**

Assessment of impact on land, water, air, social & cultural activities and on flora & fauna, mathematical models, public participation.

**SECTION-D**

Plan for mitigation of adverse impact on environment, options for mitigation of impact on water, air, land and on flora & fauna, case studies related to EIA, addressing the issues related to the project affected people. Post project monitoring,

**Books recommended:**

1. Canter, R.L., "Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 1996.
- Shukla, S.K. and Srivastava, P.R., "Concepts In Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.
- John G. Rau and David C Hooten "Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990.
- "Environmental Assessment Source Book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
- Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.



BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-III : Plant Pathology and Crop Disease Management (Theory)**

**Time: 3 Hours**

**Max. Marks: 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Introduction; definitions and concepts of plant diseases, history and growth of plant pathology, economic importance, nature and causes (biotic and abiotic) of diseases, disease development and disease cycle, general principles of control.

**SECTION-B**

General account of viruses and mycoplasma, Bacteria: structure, nutrition, economic importance and common diseases related to viruses and bacteria: Yellow Vein Mosaic of Bhindi, Citrus canker, TMV of Potato

Fungi: general characters, classification of fungi and life histories of following members in related to plant diseases; *Albugo*, *Phytophthora*, *Puccinia*, *Cercospora*, *Colletotrichum* and *Ustilago*

**SECTION-C**

Nematodes: general morphology, classification, symptoms and nature of damage caused by plant nematodes.

Introduction, history, importance and types of plant disease epidemics, factors influencing dynamics of epidemics, monitoring of plant disease epidemics and forecasting.

**SECTION-D**

Principles and methods of plant disease management based on exclusion, avoidance, eradication, protection (preventive and curative) and resistance, management of plant diseases- regulatory, cultural, biological, physical and chemical strategies, integrated disease management (including judicious use of chemicals in plant disease management), seed health certification system.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**Books Recommended**

1. Mehrotra, R.S. and A. Agarwal. 2017. Plant Pathology, 3rd Edition. TATA McGraw Hill. Pub. Company Ltd. New Dehli.
2. Campbell, C.L. and L.V. Modden. 1990. Introduction to Plant Disease Epidemiology. John Wiley & Sons, Inc. New York, USA.
3. Kranz, J. 2002. Comparative Epidemiology of Plant Diseases. Springer.
4. Alexopoulos, Mims and Blackwel. Introductory Mycology.
4. Kranz, J., 1990. Epidemics of Plant Diseases: Mathematical Analysis and Modeling. Springe Publ. London, UK.
5. Helyer, N., K. Brown and N.A. Cattlin. 2003. Biological Control in Plant Protection (A Colour Hand Book). Manson Publication Ltd, London, UK.
6. Agrios. G.N. 2005. Plant Pathology. 5th Ed. Academic Press N.Y. USA.
7. Matthews. R.E.F. 1991. Plant Virology. 3rd revised edition. Academic Press.
8. Singh, R.S. 2001. Plant Disease Management. Science Pub. Inc. India.
9. Dropkin, H.V. 1980. Introduction to Plant Nematology. A WileyInterscience Publication, New York.
10. Alexopoulos, C.J., C.W. Mims and M. Blackwell. 1996. Introductory Mycology. 4th edition, John Wiley & Sons, Inc. New York, USA.
11. Loebenstein, G. and G. Thottappilly (Eds.). 2004. Virus and Virus-like Diseases of Major Crops in Developing Countries. Springer Press.
12. Singh RS & Sitaramaiah K. 1994. Plant Pathogens – Nematodes. Oxford & IBH, New Delhi.
13. Thorne G. 1961. Principles of Nematology. McGraw Hill, New Delhi. 19) Walia RK & Bajaj HK. 2003. Text Book on Introductory Plant Nematology. ICAR, New Delhi.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-III : Plant Pathology and Crop Disease Management (Practical)**

**Time: 3 Hours**

**Max. Marks: 25**

**Suggested Exercises:**

1. Acquaintance with microscope and other lab equipments.
2. Various techniques of sterilization and preparation of media.
3. General study of different plant disease caused by viruses, bacteria, fungi and nematodes.
4. Enumeration of microbial population in soil- bacteria, fungi and actinomycetes.
5. Extractions of nematodes from soil.
6. Gram staining of bacteria.
7. Study of fungicides and their formulations.
8. Collection and preservation of disease specimens.

**Books Recommended-**

1. M T Madigan, and J M Martinko, 2014. Biology of Microorganisms 14thEdn.
2. Pearson.M J Pelczar, 1998. Microbiology 5 thEdn. Tata McGraw Hill Education Pvt. Ltd.
3. R P Singh, 2007. General Microbiology. Kalyani Publishers.
4. Pelczar, jr.M.J.E.C.S.Chan and Krieg, N.R. 1996. Microbiology. McGraw Hill Publishers, Newyork.
5. Madigan, M. Martinkoj, M. and Parker (10 ed.) 2003. Biology of Microorganisms.
6. Pathak, V. N. Essentials of Plant Pathology. Prakash Pub., Jaipur
7. Kamat, M. N. Introductory Plant Pathology. Prakash Pub, Jaipur
8. Singh RS. 2008. Plant Diseases.8 th Ed. Oxford & IBH.Pub.Co.
9. Dhingra OD & Sinclair JB. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
10. Nene YL &Thapliyal PN. 1993. Fungicides in Plant Disease Control. 3rd Ed. Oxford & IBH, New Delhi.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-IV : Food Legislation and Quality Systems (Theory)**

**TIME: 3 HR**

**MAX. MARKS : 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Objectives, importance and functions of quality control. Methods of quality assessment of food materials fruits, vegetables, cereals, dairy products, meat, egg and processed products.

**SECTION-B**

Sampling, specifications of raw materials and finished products. Sensory evaluation. SQC and control chart technique: concept of ISO 9000.

**SECTION-C**

**Quality Attributes:** Size, Shape, Colour, Aroma, Texture.

**SECTION-D**

Basic concept, HACCP, TACCP, ISO series, TQM - concept and need for quality, structure of risk Analysis. Implementation of food safety programme, testing for food safety and performance standards..Food safety laws and regulations (FSSAI). New approaches to food safety, food labelling and nutrition labelling. Food traceability.

**Recommended Books:**

1. Quality Control for Food Industry by Kramer A, Twigg BA, 1970, AVI Publishers, USA.
2. Handbook of Analysis and Quality Control for Fruits & Veg. Products by Ranganna S, 2<sup>nd</sup> Ed., 2000, Tata McGraw Hill, New Delhi.
3. Food Science by Potter NN, 5<sup>th</sup> Ed, 2006, CBS Publishers New Delhi.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-IV : Food Legislation and Quality Systems  
(Practical)**

**Marks: 25**

**Instructions for the Paper Setters: Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.**

1. Quality evaluation of milk & milk products.
2. Quality evaluation of cereals.
3. Quality evaluation of fruits and vegetables.
4. Quality evaluation of Oils & Fats.
5. Quality evaluation of Meat & Poultry.
6. Adulterants in milk, cereals, oils & fats and their detection.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-V : FOOD PLANT LAYOUT AND SANITATION**  
**(Theory)**

**Time: 3 Hrs.**

**Max. Marks: 75**

**Instructions for the Paper Setters:-**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

**SECTION-A**

Plant design concepts and general design considerations; plant location - location factors and their interaction with plant location, location theory models

**SECTION-B**

plant size-factors affecting plant size and their interactions. Process selection; process flow charts.

**SECTION-C**

Equipment selection including economic analysis of equipment alternatives; plant layout, layout symbols; planning and design of service facilities, human resource.

**SECTION-D**

Importance of a plant layout selection of site and layouts of different food industries, selection of equipment, machinery and building material, selection and planning of manufacturing process and service facilities.

**Recommended Books:**

1. Principle of Food Sanitation by Marriott, 5th Ed., 2006, CBS Publishers, New Delhi.
2. Food Processing Waste Management by Green JH and Kramer A, 1979, AVI Publishers, USA.
3. Food Science by Potter NN, 5th Ed., 2006, CBS Publishers, New Delhi.
4. Plant layout and material handling by Sharma S.C.
5. Plant layout & design by James Moore

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-V : FOOD PLANT LAYOUT AND SANITATION**

**(Practical)**

**Marks: 25**

**Instructions for the Paper Setters: Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.**

- Calculation of depreciation of machinery and processing costs.
- Preparation of layout and process diagram of potato crisp manufacturing plant.
- Preparation of layout and process diagram of Jam/Marmalade manufacturing plant.
- Preparation of layout and process diagram of Bread making plant.
- Preparation of layout and process diagram of a dairy industry.
- Preparation of layout and process diagram of wine making unit.
- Preparation of layout and process diagram of a modern slaughter house.
- Preparation of layout and process of diagram of a confectionary unit.

BACHELOR OF VOCATION (B.Voc.)  
(AGRI FOOD SCIENCE) (SEMESTER-IV)

**PAPER-VI : INDUSTRIAL TRAINING**

**Report Assessment : (Satisfactory / Unsatisfactory)**

The student will submit a report after Industrial Training. The report will be evaluated as Satisfactory / Unsatisfactory.