Choice Based Credit System

Scheme & Syllabus of

Bachelor of Science (Hons) in Food Technology

B.Sc. (Hons)Food Technology

Batch 2021 onwards

By

Board of Study Food Engineering

Department of Academics

IK Gujral Punjab Technical University

Vision:

To create competent professionals those, contribute towards the economic development of the nation by going in line with the policy of Government of India in the field of food processing food safety and security.

Mission:

• Development of human resources in the field of food science and technology to serve the cause of nation

• Providing a strong theoretical and practical background across the food science discipline with an emphasis on developing sustainable resources to cater food and nutrition related challenges

• Development of human resources in the area of clinical nutrition and research to contribute effectively in making India healthy

• Create favorable environment for innovation to translate theoretical knowledge into practical applications

• Inculcating professional ethical values, innovative research capabilities and leadership abilities

• Holistic development of the youth through the process of self evaluation and continuous improvement

Program Education Objectives:

1. To make the students competent in developing the foods of the future by utilizing technologies such as dehydration, freezing, irradiation, fermentations, applications of enzymes in food processing, food product development, nutraceuticals, nutritional and functional foods.
2. To keep students abreast with the rapid developments reported within technology and biological science that is creating completely new ways of developing various processed food.
3. To impart an understanding of modern food processing and profound knowledge of technology associated with the development of healthy and safe foods.
4. To motivate and enable students of BSc. Food Science & Technology to opt for higher levels of learning viz. post-graduate program, doctoral programs by research in this interdisciplinary field with the view of developing highly skilled professionals to work in Industry and academia.

Program Outcomes:

1. To impart knowledge of various areas related to Food Science and Technology
2. To enable the students to understand food composition and its physico- chemical, nutritional, microbiological and sensory aspects,
3. To familiarize the students about the processing and preservation techniques of pulses, oilseeds, spices, fruits and vegetables, meat, fish, poultry, milk & milk products,
4. To emphasize the importance of food safety, food quality, food plant sanitation, food laws and regulations, food engineering and packaging in food industry.
5. To impart an understanding of modern food processing and profound knowledge of technology associated with the development of healthy and safe foods.

Mapping of Program Outcomes with Program Education Objectives:-

POE / PO	POE1	POE2	POE3	POE4
PO1	**1**	**1**	**1**	**3**
PO2	**1**	**1**	**1**	**2**
PO3	**1**	**1**	**1**	**2**
PO4	**1**	**2**	**1**	**1**
PO5	**1**	**1**	**1**	**1**

Bachelors of Science (Hons) in Food Technology: B.Sc. (Hons) Food Technology
It is a Under Graduate (UG) Programme of 4 years duration (8 semesters)

Eligibility for Admission: A Candidate who has passed Plus Two (Science) or Plus Two arts with food preservation /food science and technology vocational subject of the Punjab School Education Board / C.B.S.E. / I.C.S.E. with 40% marks or any other equivalent examination.

Courses & Examination Scheme:

Semester First

Course Code	Course Title	Load Allocation			Marks Distribution		Total	Credits
		L	T	P	Internal	External		
BSFT111-21	Introduction to Food Science	4	0	0	40	60	100	4
BSFT112-21	Technology of Food Preservation	4	0	0	40	60	100	4
BSFT113-21	Lab - Introduction to Food Science	0	0	4	30	20	50	2
BSFT114-21	Lab - Technology of Food Preservation	0	0	4	30	20	50	2
	GE -1*	4	0	0	40	60	100	4
	GE -1 Lab*	0	0	4	30	20	50	2
BTHU103-18	English	1	0	0	40	60	100	1
BTHU104-18	English (Lab)	0	0	2	30	20	50	1
HVPE101-18	Human Values, De-addiction and Traffic Rules	3	0	0	40	60	100	3
HVPE102-18	Human Values, De-addiction and Traffic Rules (Lab/ Seminar)	0	0	1	--	25*	25*	1
	Mentoring and Professional Development	0	0	1	25*	---	25*	1
	Total	**16**	**0**	**16**	**345**	**405**	**750**	**25**

* The student is required to register for Generic Elective Courses of his/her choice from any department other than the parent department. The credit of the subject should be as highlighted in a scheme where as the marks scheme for Generic Elective Courses can be depend on subject selected by the students from other department.

-The Human Values, De-addiction and Traffic Rules (Lab/ Seminar) and Mentoring and Professional Development course will have internal evaluation only.

Semester Second

Course Code	Course Title	Load Allocation			Marks Distribution		Total	Credits
		L	T	P	Internal	External		
BSFT121-18	Food and Nutrition	4	0	0	40	60	100	4
BSFT122-18	Post-harvest management of Fruits & Vegetables	4	0	0	40	60	100	4
BSFT123-18	Lab - Food and Nutrition	0	0	4	30	20	50	2
BSFT124-18	Lab-Post-harvest management of Fruits & Vegetables	0	0	4	30	20	50	2
-	*SEEC-1	0	0	2	30	20	50	2
-	**GE -2 Theory	4	0	0	40	60	100	4
-	**GE – 2 Lab	0	0	4	30	20	50	2
EVS102-18	Environmental Science	2	0	0	40	60	100	2
MPD 202-18	***Mentoring and Professional Development	0	0	1	25	--	25	1
	Total	**14**	**0**	**15**	**305**	**320**	**625**	**23**

* The student is required to register anyone from Skill Enhancement Elective Course.

** The student is required to register for Generic Elective Courses of his/her choice from any department other than the parent department. The credit of the subject should be as highlighted in a scheme whereas the marks scheme for Generic Elective Courses can depend on subject selected by the students from other department.

*** Mentoring and Professional Development course will have internal evaluation only.

Important Notes: -

1. The department will offer the Generic Elective Courses for the students of other department.
2. Theory courses will be of 04 hours and practical will be of 04 hours duration per week. For all lecture courses, one credit per lecture/week/semester will generally be adopted. One laboratory hour per week per semester will be assigned half credit.
3. No elective course will be run unless the number of students registered for the elective course is five or more.
4. The student is required to register for Generic Elective Courses of his/her choice from any department other than the parent department.

SEMESTER FIRST

BSFT111-21: INTRODUCTION TO FOOD SCIENCE

Total Marks: 100	L	T	P
	4	0	0

Course Objectives:

- To study the structure, composition, nutritional quality and post -harvest changes of various plant foods.
- To impart basic knowledge regarding processing aspects of different foods
- To study the structure and composition of various animal foods.

UNIT I

Introduction: - Introduction to food science, food technology and food engineering. Status of food industry in India and abroad.

Nutrients and functions of food *viz.* Carbohydrates, Protein, Lipids, Vitamins, Minerals. Changes in nutrients during processing and storage of food.

Water: Physical properties of water and Ice, chemical, nature, structure of the water molecule. Absorption phenomena, types of water solutions and collidative properties; Free and bound water; Water activity and Food spoilage; Freezing and Ice structure.

UNIT II

Food Dispersions- Introduction, structure and stability of different types of food dispersions

Composition and nutritive value of plant foods

Cereals and millets: General outline, Composition & Nutritive value, Structure of wheat and Rice, Changes during cooking and germination of cereals and millets grains.

Pulses: Composition, Nutritive value, Antinutritional factors Changes during cooking, Factors affecting and changes during processing of pulses-soaking, germination, decortications, cooking and fermentation.

UNIT III

Composition and nutritive value of plant foods

Nuts & Oilseeds: Composition, sources of proteins and oil, classification of lipids, types of fatty acids, Processing of oil seeds - Soya bean, coconut; Protein isolates; Texturized vegetable protein. Rancidity- Types- hydrolytic and oxidative rancidity and its prevention.

Fruits & Vegetables: Composition, Classification, Nutritive value, Vegetable Cookery, Changes during maturing, Ripening, storage and cooking of fruits and vegetables. Climacteric, Non climacteric fruits, Concept of enzymatic browning.

Spices & herbs: Definition, Classification, Chemical composition, use of spices & herbs. Overview of essential oils and oleoresins.

UNIT IV

Composition and Nutritive Value of Flesh Foods

Eggs: Structure, Composition, Nutritive value of egg, Grading Changes during cooking & storage.

Fish: Composition, Nutritive value of fish, effect of different processing.

Meat: Structure, composition, types and nutritive value of meat, effect of different processing

Composition and Nutritive Value of dairy products

Milk: Definition, composition, nutritive value of milk and milk products; An overview of types of market milk and milk products; changes during processing like pasteurization and homogenization and storage of milk and milk products

Health Foods

Health foods: Concept of Nutraceuticals, Functional foods, Prebiotics, Probiotics, organic foods, GM foods

Recommended Readings:

1. Deman JM, Principles of Food Chemistry, Van Nostrand Reinhold, NY
2. Meyer LH, Food Chemistry, CBS Publication, New Delhi
3. Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi
4. Potter NH, Food Science, CBS Publication, New Delhi
5. Ramaswamy H and Marcott M,Food Processing Principles and Applications CRC Press
6. De Sukumar, Outlines of Dairy Technology, Oxford Publishers
7. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi
8. Bawa A.S., O.P Chauhan et al. Food Science. New India Publishing agency
9. Roday S., Food Science, Oxford Publication
10. Srilakshmi B., Food Science, New Age Publishers

Course Outcomes:

CO1: To understand physico-chemical properties of macro and micro nutrients in food.

CO2: To understand classification and composition of food sources of plant and animal origin.

CO3: To access the nutritional values of different food sources.

CO4: To evaluate and understand the influence of processing on various food components.

CO5: To study the utilization of different food sources.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4	CO5
PO1	1	1	1	1	1
PO2	1	1	1	1	1
PO3	3	3	3	1	3
PO4	3	3	3	3	3
PO5	2	3	1	3	1

BSFT112-21: TECHNOLOGY OF FOOD PRESERVATION

Total Marks: 100	L	T	P
	4	0	0

Course Objective:

- To impart knowledge on the causes of food spoilage and principles of different techniques used in processing and preservation of foods.
- To identify and select preservation methods appropriate for specific foods and to learn the effects of preservation methods on the quality of food

UNIT I

Scope and importance of food preservation, Historical developments in food processing. Types of foods and causes of food spoilage. Definition of shelf life, perishable foods, semi perishable foods, shelf stable foods. Principles of Food Preservation

Food Microbiology: microorganisms associated with foods- bacteria, yeast and mold, Importance of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, pH, water activity, nutrient and oxygen requirements, typical growth curve of micro-organisms. Food infection, food intoxication.

UNIT II

Food Preservation by Low temperature

Freezing and Refrigeration: Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e.slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.

Food Preservation by high temperature

Thermal Processing- Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time, Lethality concept, characterization of heat penetration data, Thermal process Calculations; Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching.

UNIT III

Food Preservation by Moisture control

Drying and Dehydration - Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve,; Effect of food properties on dehydration, change in food during drying ,drying methods and equipments air convection dryer, tray dryer, tunnel dryer ,continuous belt dryer , fluidized bed dryer, spray dryer, drum dryer, vacuum dryer ,freeze drying ,foam mat drying.

Evaporation – Definition, factors affecting evaporation, names of evaporators used in food industry.

UNIT IV

Ambient-Temperature Processing

Separation processes: Principles and methods of: washing, filtration, sedimentation, sieving and centrifugation

Food Preservation by Irradiation

Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of

action, uses of radiation processing in food industry, concept of cold sterilization.

Food Preservation by Preservatives: Uses and effects of class I and class II preservatives in foods.

Recommended Readings:

1. Sivasankar, B. *Food processing and preservation:* Hall of India Pvt., New Delhi.
2. Fellows, P. J.. *Food processing Technology: Principles and Practice:* Woodhead Publishing.
3. Brennan, J. G. *Food Processing Handbook:* Weinheim: Wiley-VCH.
4. Zeuthen, P. & Bogh- Sprensen, L. Food Preservation Techniques: CRC Press, Bocaraton.
5. Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBS Publication, New Delhi
6. Paine FA and Paine HY, Handbook of Food Packaging, Thomson Press India Pvt Ltd, New Delhi
7. Potter NH, Food Science, CBS Publication, New Delhi
8. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press
9. Rao PG, Fundamentals of Food Engineering, PHI Learning Pvt Ltd, New Delhi
10. Toledo Romeo T, Fundamentals of Food Process Engineering, Aspen Publishers.
11. Vonloesecka, H. W. *Drying and Dehydration of Foods:* Allied, Bikaner.
12. B. Srilakshmi, Food science, New Age Publishers.
13. Bawa. A.S, O.P Chauhan etal. Food Science. New India Publishing agency.
14. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi.

Course Outcomes:

1. To impart knowledge on the causes of food spoilage.
2. To learn principles of different techniques used in processing and preservation of foods.
3. To identify and select preservation methods appropriate for specific foods.
4. To learn the effects of preservation methods on the quality of food.
5. To learn different permitted food additive used in food industry.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4	CO5
PO1	1	1	1	1	1
PO2	1	3	2	3	3
PO3	1	1	1	1	1
PO4	2	2	1	1	1
PO5	3	1	1	2	1

BSFT113-21: INTRODUCTION TO FOOD SCIENCE (LAB)

Total Marks: 50

L	T	P
0	0	4

Course Objectives: To impart basic knowledge regarding the quantitative and qualitative evaluation of different foods

Course Content

1. Orientation to working in a food analysis lab.
2. Identification of different non-perishable commodities-cereals, millets and their by-products.
3. Quality evaluation/inspection of different foods. i. Spices and Condiments ii. Pulses iii. Nuts and oilseeds iv. Tea and coffee
4. Study of different types of browning reactions: enzymatic and non enzymatic.
5. To Study the germination of cereals and pulses.
6. Study of fermentation and dextrinization.
7. To study gelatinization behavior of various starches
8. Identification of pigments in fruits and vegetables and influence of pH on them
9. To study the concept of gluten formation of flour.
10. Estimation of reducing sugar by Fehlings procedure
11. Estimation of salt content in brine
12. Preparation of brix solution and checking by hand refractometer
13. Application of collioidal chemistry to food preparation
14. Demonstration of the Soxhlet method for determination of fat content
15. Determination of acidity of water
16. Determination of alkalinity/ hardness of water
17. Demonstration of the Kjeldahl's method for estimation of protein content
18. Quality inspection of animal foods.

Course Outcomes:

CO1: To acquaint the students to the work in the food analysis laboratory.

CO2: Introduction to fundamentals of food processing and evaluation.

CO3: Evaluation of composition and functionality of food products.

CO4: Explaining different methods used for food analysis.

CO5: Evaluation of food products by qualitative and quantitative methods.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4	CO5
PO1	1	1	1	1	1
PO2	3	1	1	1	1
PO3	3	1	1	1	1
PO4	1	1	1	1	1
PO5	3	1	1	2	1

BSFT114-21: TECHNOLOGY OF FOOD PRESERVATION (LAB)

Total Marks: 50

L	T	P
0	0	4

Course Objective:

- To understand the effect of various preservation techniques on the quality and safety of food products.
- To design and evaluate a processing procedure used to preserve a food product.

Course Contents

1. Sampling techniques and preparation of test samples.
2. Concept of shelf life of different foods
3. To study the concept of Asepsis and sterilization
4. Determination of pH of different foods using pH meter.
5. Study quality characteristics of foods preserved by drying/dehydration/ freezing.
6. To perform pasteurization of fluids using different methods.
7. To perform blanching of different plant foods.
8. Pickling and curing of foods,
9. Determination of sodium chloride in brine,
10. Determination of moisture content in fresh and dried food samples,
11. Effect of pH on microbial stability of food,
12. Dehydration of foods
13. Use of chemical preservatives in food
14. Preservation of food by canning (Fruit/Vegetable/meat)
15. Cut-out analysis of canned food
16. Comparison of conventional and microwave processing of food

Course Outcomes:

1. To understand the sampling techniques and preparation of test samples.
2. To understand the effect of various preservation techniques on the quality and safety of food products.
3. To design and evaluate a processing procedure used to preserve a food product.
4. To understand the physical and chemical evaluation of thermally processed food.
5. To understand and utilize different food preservation techniques.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4	CO5
PO1	1	1	1	1	1
PO2	1	1	1	1	1
PO3	1	1	1	1	1
PO4	2	1	1	1	1
PO5	3	2	2	2	1

BTHU103-18: ENGLISH

Total Marks: 100	L	T	P
	1	0	0

Course Objectives:

The objective of this course is to introduce students to the theory, fundamentals and tools of communication.

UNIT- I

Introduction

- Theory of Communication
- Types and modes of Communication

UNIT- II

Language of Communication

- Verbal and Non-verbal
- (Spoken and Written)
- Personal, Social and Business
- Barriers and Strategies
- Intra-personal, Inter-personal and Group communication

UNIT- III

Reading and Understanding

- Close Reading
- Comprehension
- Summary Paraphrasing
- Analysis and Interpretation
- Translation(from Hindi/Punjabi to English and vice-versa)
- Literary/Knowledge Texts

UNIT- IV

Writing Skills

- Documenting
- Report Writing
- Making notes
- Letter writing

Recommended Readings:

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English*, Pearson, 2008.
3. *Language, Literature and Creativity*, Orient Blackswan, 2013.
4. *Language through Literature* (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas
5. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
6. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

Course Outcomes:

- To help the students become the independent users of English language.
- To develop in them vital communication skills which are integral to their personal, social and professional interactions.

- The syllabus shall address the issues relating to the Language of communication.
- Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc.

BTHU104-18: ENGLISH (LAB)

Total Marks: 100	L	T	P
	2	0	0

The objective of this course is to introduce students to the theory, fundamentals and tools of communication.

Interactive practice sessions in Language Lab on Oral Communication

- Listening Comprehension
- Self Introduction, Group Discussion and Role Play
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations
- Monologue
- Effective Communication/ Mis- Communication
- Public Speaking

Recommended Readings:

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English*, Pearson, 2008.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
5. *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes:

- To help the students become the independent users of English language.
- To develop in them vital communication skills which are integral to personal, social and professional interactions.
- The syllabus shall address the issues relating to the Language of communication.
- Students will become proficient in professional communication such as interviews, group discussions and business office environments, important reading skills as well as writing skills such as report writing, note taking etc.

HVPE101-18: HUMAN VALUES, DE-ADDICTION AND TRAFFIC RULES

Total Marks: 100	L	T	P
	3	0	0

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT- II

Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya*- Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT- III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. Understanding harmony in the Family- the basic unit of human interaction
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
   Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship

3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!- Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT- IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature

3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT- V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:
   a) Ability to utilize the professional competence for augmenting universal human order,
   b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
   c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:
   a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
   b) At the level of society: as mutually enriching institutions and organizations

Recommended Readings:

1. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered,* Blond & Briggs, Britain.
3. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, *Science and Humanism,* Commonwealth Purblishers.
6. A.N. Tripathy, 2003, *Human Values,* New Age International Publishers.
7. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome's report,* Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers ,* Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, *Engineering Ethics (including Human Values),* Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, *Foundations of Ethics and Management,* Excel Books.
12. B L Bajpai, 2004, *Indian Ethos and Modern Management,* New Royal Book Co., Lucknow. Reprinted 2008.
13. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, *http://uhv.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth,* Paramount Classics, USA
4. Charlie Chaplin, *Modern Times,* United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*

HVPE102-18: HUMAN VALUES, DE-ADDICTION AND TRAFFIC RULES (LAB/ SEMINAR)

Total Marks: 25	L	T	P
	0	0	1

One each seminar will be orgnizied on Drug De-addiction and Traffic Rules. Eminent scholar and experts of the subject will be called for the Seminar atleast once during the semester. It will be binding for all the students to attend the seminar.

MENTORING AND PROFESSIONAL DEVELOPMENT

Total Marks: 25	L	T	P
	0	0	1

Guidelines regarding Mentoring and Professional Development

The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Part – A (Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B (Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.

SEMESTER SECOND

I.K. Gujral Punjab Technical University
B.Sc. (Hons) Food Technology, Batch 2021 onwards

BSFT121-18: FOOD AND NUTRITION

Total Marks: 100

L	T	P
4	0	0

Course Objective

- To develop scientific awareness about linkage between food, nutrition and health
- To understand importance of balanced diet and source of various nutrient like carbohydrates, protein , vitamin etc.
- To develop ability for planning the meals and methodology of healthy cooking
- To understand legality of labeling and Guidelines of codex and FSSAI

UNIT I

INTRODUCTION TO FOOD AND NUTRITION: Basic terms used in study of food and nutrition, BMI and Nutritional Status, Understanding relationship between food, nutrition and health.

BALANCED DIET: Functions of food-physiological, psychological and social, Concept of Balanced Diet, Food Groups, Food Pyramid.

UNIT II

NUTRIENTS: Classification, digestion, functions, dietary sources, RDA, clinical manifestations of deficiency and excess and factors affecting absorption of the following in brief: Energy, Carbohydrates, lipids and proteins

UNIT III

NUTRIENTS: Classification, digestion, functions, dietary sources, RDA, clinical manifestations of deficiency and excess and factors affecting absorption of the following in brief: Fat soluble vitamins-A, D, E and K; Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C; Minerals – calcium, iron, iodine, fluorine, copper and zinc

UNIT IV

CONCEPTS OF MEAL PLANNING: Factors affecting meal planning, understanding specific considerations for planning meal for different groups of people.

METHODS OF COOKING: Dry, moist, frying and microwave cooking, Advantages, disadvantages and the effect of various methods of cooking on foods.

NUTRITIONAL LABELING: Importance, global trends, codex guidelines, nutritional labelling in India, FSSAI guidelines.

Recommended Readings:

1. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd Edition. Oxford and IBH Publishing Co. Pvt. Ltd.
2. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd.
3. Srilakshmi,(2005), Dietetics, Revised 5th edition. New Age International Ltd.
4. Wardlaw MG, Paul M Insel Mosby 1996). Perspectives in Nutrition, Third Edition.
5. Codex Guidelines on Nutrition Labelling (CAC/GL 2_1985) (Rev.1_1993). Rome, Food and Agriculture Organisation of the United Nations / World Health Organisation, 1993.
6. Food Safety and Standards Authority of India portal, Government of India
7. Gopalan, C., (1990). NIN, ICMR. Nutritive Value of Indian Foods.
8. Seth V, Singh K (2005). Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual, Fourth edition, Elite Publishing House Pvt Ltd.
9. Introduction to Human Nutrition ed.Gibney et al, Blackwell Publishers, 2005
10. Khanna K, Gupta S, Seth R, Mahna R, Rekhi T (2004). The Art and Science of Cooking: A Practical Manual, Revised Edition. Elite Publishing House Pvt Ltd.

11. NIN, ICMR (1990). Nutritive Value of Indian Foods.
12. Seth V, Singh K (2005). Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual, Fourth edition, Elite Publishing House Pvt Ltd.
13. ICMR (2010). Nutrient Requirements and Recommended Dietary Allowances for Indians.

Course outcomes

- To be practice oriented nutritionist
- To manage advisory role as meal planner
- To have scientific cooking methodologies as per nutritionist guidelines
- To understand labeling content for Food products

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4
PO1	1	1	1	1
PO2	1	1	1	1
PO3	2	1	1	1
PO4	2	2	2	1
PO5	1	1	1	1

I.K. Gujral Punjab Technical University
B.Sc. (Hons) Food Technology, Batch 2021 onwards

BSFT122-18: POST-HARVEST MANAGEMENT OF FRUITS & VEGETABLES

Total Marks: 100	L	T	P
	4	0	0

Course Objective

- Acquire knowledge on various management technologies on pre-harvest of fruits and vegetables.
- Acquire knowledge on various management technologies on post-harvest of fruits and vegetables.
- To study the different ripening stages of fruits and vegetables
- To understand the techniques of processing & preservation of fruits and vegetables.

UNIT I

Present status of post harvest technology in India.

Importance and role of post harvest technology.

Post harvest losses of fruits and vegetables and factors affecting the post harvest losses. Post harvest changes in fruits and vegetables Harvesting methods – manual and mechanical.

UNIT II

Maturity indices of fruits and vegetables-Importance of maturity indices, determination of harvest maturity Climacteric and Non climacteric fruits, Fruit ripening and changes, Ethylene biosynthesis.

UNIT III

Cleaning, Sorting & Grading of fruits and vegetables

Post harvest physical and chemical treatments to enhance the shelf life of fruit and vegetables.

UNIT IV

Transportation methods of fruits and vegetables Storage of fruits and vegetables Post harvest diseases of fruits and vegetables, Post harvest loss assessment and loss reduction.

Recommended Readings:

1. Preservation of fruits and vegetables by Girdhari Lal, Sidappa G S and Tandon G L, 1960, ICAR, New Delhi.
2. Food facts & principles by Shanuntala Manay N & Shadoksharaswamy N, 1996, New Age World Publisher, CA.
3. Food Science by Potter, N.N., CBS Publisher, New Delhi.

Course Outcomes:

- Understanding on the post-harvest losses and role of post-harvest technology.
- Knowledge on fruit and vegetable physiology, composition and various nutritional changes in fruits and vegetables.
- Understanding the maturity indices and quality criteria of fruits and their intervention in processing.
- Gaining knowledge on post-harvest techniques, packaging and storage interventions for shelf-life extension of fresh produce.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4
PO1	1	1	1	1
PO2	2	2	2	2
PO3	3	2	2	2
PO4	1	1	1	1
PO5	2	2	2	2

BSFT123-18: FOOD AND NUTRITION (LAB)

Total Marks: 50

L	T	P
0	0	4

Course objectives

- Practical exposure of students in the area of food, their sources and nutritional value.
- To acquaint the students regarding concept of food assimilation, nutrition through lifecycle, and malnutrition.
- To understand the concept of nutritious snacks, convenience foods and nutrition labelling.
- To acquire knowledge about meal planning for different age group.

Course Content

1. Identification of food sources for various nutrients using food composition tables.
2. Record diet of self-using 24 hour dietary recall and its nutritional analysis.
3. Introduction to meal planning, concept of food exchange system.
4. Planning of meals for adults of different activity levels for various income groups.
5. Planning of nutritious snacks for different age and income groups.
6. Preparation of nutritious snacks using various methods of cooking.
7. Nutritional labeling of food products.
8. Estimation of BMI and other nutritional status parameters.

Course Outcome:

- Determination of various food nutrients, sources, and associated deficiencies,
- Understanding about concept of nutritious snack, their preparation for different income groups.
- Understanding the concept of nutrition labelling.
- Understanding about food assimilation and malnutrition.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4
PO1	1	1	1	1
PO2	1	1	1	1
PO3	2	1	1	1
PO4	2	2	2	1
PO5	1	1	1	1

BSFT124-18: POST-HARVEST MANAGEMENT OF FRUITS & VEGETABLES (LAB)

Total Marks: 100	L	T	P
	4	0	0

Course objectives

- Practical exposure of students in the area of post-harvest technology of fruits and vegetables.
- To acquaint the students regarding effects of pre-processing treatments on shelf-life of fruit.
- To understand the techniques of processing & preservation of fruits and vegetables.
- To study the different ripening stages of fruits and vegetables

Course Content

1. Analyze the maturity stages of fruits and vegetables.
2. To study the effect of pre-packing of fruits and vegetables.
3. To study the effect of pre-cooling of fruits and vegetables.
4. To study the ripening of fruits and vegetables.
5. To study the shelf life of fruits and vegetables at low- temperature.
6. To study the different types of spoilage in fruits and vegetables.
7. To determine the optimum temperature for storage of different fruits and vegetables.
8. To study the effect of wax coating on shelf life of fruits and vegetables.
9. Visit to a cold store and controlled atmosphere storage.

Course Outcomes: On completion of the course the students are expected to:

- Determine and understand the maturity indices of fruits and vegetables.
- To understand the effect of pre-cooling and pre-packaging of fruits and vegetables.
- To acquire knowledge about the types of spoilage and shelf life of fruits and vegetables.
- To understand the effects of optimum temperature, wax coating and control atmosphere storage.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4
PO1	1	1	1	1
PO2	1	1	1	1
PO3	2	1	1	1
PO4	3	2	2	1
PO5	1	1	1	1

EVS102-18: ENVIRONMENT STUDIES

Total Marks: 100	L	T	P
	2	0	0

UNIT- I

Introduction to environmental studies

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

UNIT- II

Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:
    a) Forest ecosystem
    b) Grassland ecosystem
    c) Desert ecosystem
    d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT- III

Natural Resources : Renewable and Non---renewable Resources

- Land resources and landuse change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water : Use and over---exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter---state).
- Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT- IV

Biodiversity and Conservation

- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega---biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity : Habitat loss, poaching of wildlife, man---wildlife conflicts, biological invasions; Conservation of biodiversity : In---situ and Ex---situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT- V

Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management : Control measures of urban and industrial waste.
- Pollution case studies.

UNIT- VI

Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture

- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

UNIT- VII

Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management : floods, earthquake, cyclones and landslides.
- Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

UNIT- VIII : Field work

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site---Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems---pond, river, Delhi Ridge, etc.

***Recommended readings*:**

1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.*Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.*Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science,* 339: 36---37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29---64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971.*Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.*Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.
14. Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology*: *Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger*: *A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006.*The Creation: An appeal to save life on earth*. New York: Norton.
20. World Commission on Environment and Development. 1987.*Our Common Future*. Oxford University Press.

MPD202-18: MENTORING AND PROFESSIONAL DEVELOPMENT

Total Marks: 25

L	T	P
0	0	1

Guidelines regarding Mentoring and Professional Development

The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Part – A
(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B
(Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.

SKILL ENHANCEMENT ELECTIVE COURSES

BSCSEC-101-21: ENTREPRENEURSHIP DEVELOPMENT

Total Marks: 50 (30 Internal + 20 external)	L	T	P
	0	0	2

Course Objectives

- Evaluation and development and of entrepreneurial skills
- Business opportunity Identification and learning of assessment techniques
- Preparation of food business plan
- SWOT Analysis for food business

UNIT I

ENTREPRENEURIAL DEVELOPMENT: Case studies of successful entrepreneurs; Exercises on ways of sensing opportunities – sources of idea, creating efforts, SWOT Analysis; Entrepreneurial skill assessment test; Techniques of development of entrepreneurial skills, positive self image and locus of control

UNIT II

FOOD BUSINESS MANAGEMENT: Case studies of Food Processing Business and its aspects; Business opportunity Identification and Assessment techniques; Business Idea Generation and evaluation exercise; Market Assessment study Analysis of competitive situation; SWOT Analysis for business and for competitors; Preparation of business plan; Preparation of project report; Methods of Arrangement of inputs – finance and material.

Recommended Readings

1. Vasant Desai (2012) Fundamentals of Entrepreneurship and Small Business Management, Himalya Publishing House Pvt. Ltd., Mumbai
2. Vasant Desai (2011) The Dynamics of Entrepreneurial Development and Management, Himalya Publishing House Pvt. Ltd., Mumbai
3. D. David and S Erickson (1987) Principles of Agri Business Management , Mc Graw Hill Book Co., New Delhi.
4. Acharya S S and Agarwal N L (1987) Agricultural Marketing in India, Oxford & ISH Publishing Co., New Delhi.
5. David H. Holt (2002) Entrepreneurship – Anew Venture Creation, Prentice Hall of India, New Delhi.
6. Phill Kottler (1994) Marketing Management, Prentice Hall of India Private Limited, New Delhi.
7. Chandra, Prasanna (1996) Projects, Planning, Analysis, Selection, Implementation and Review, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Course Outcomes:

- To help the students to become the food entrepreneur.
- To develop the ability to entrepreneurial skills.
- To develop the skills related to Business feasibility analysis such as technical Feasibility, economic Feasibility, organizational feasibility and legal Feasibility.
- To able to develop Food Processing Business plan.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	CO1	CO2	CO3	CO4
PO1	1	2	1	1
PO2	3	3	3	3
PO3	3	3	1	2
PO4	3	3	2	2
PO5	3	2	2	2