GURU JAMBHESHWAR UNIVERSITY OF SCIENCE AND TECHNOLOGY, HISAR
(Established by State Legislature Act 17 of 1995)
'A+' Grade, NAAC Accredited State Govt. University

Acad./AC-III/BOS&R-1/2025/ 2763
Dated: 22/5/25

To

The Controller of Examinations,
GJUST, Hisar.

Sub: **Approval of scheme of examination and syllabi of Integrated B.Sc. (Hons./Hons. with Research) – M.Sc. in Food Technology 2nd year (3rd and 4th semester) alongwith the subject of various pools of courses offered by Food Technology Department i.e. MDC, MIN, SEC, VOC, VAC etc. w.e.f. academic session 2024-25 as per NEP-2020, being run in University Teaching Department.**

Sir,

I am directed to inform you that the Vice-Chancellor, on the recommendations of Dean, Faculty of Environmental and Bio Sciences & Technology on 13.05.2025, is pleased to approve the scheme of examinations and syllabi of Integrated B.Sc. (Hons./Hons. with Research) – M.Sc. in Food Technology 2nd year (3rd and 4th semester) alongwith the subject of various pools of courses offered by Food Technology Department i.e. MDC, MIN, SEC, VOC, VAC etc. w.e.f. academic session 2024-25 as per NEP-2020, being run in University Teaching Department, under NEP-2020, under Section 11(5) of the University Act, 1995 in anticipation of approval of the Academic Council.

A copy of the scheme of examinations & syllabi of above said course is enclosed herewith.

You are therefore, requested to take further necessary action accordingly.

Yours faithfully
[signature] 22/5/25
Asstt. Registrar (Academic)
for Registrar

Endst. No. Acad./AC-III/BOS&R-1/2025/ 2764-67 Dated: 22/5/25

A copy of above is forwarded to the following for information and necessary action:-

1. Dean, Faculty of Environmental and Bio Sciences & Technology, GJUST, Hisar.
2. Chairperson, Department of Food Technology, GJUST, Hisar. She is requested to arrange to upload the scheme of examinations and syllabi of Integrated B.Sc. (Hons./Hons. with Research) – M.Sc. in Food Technology 2nd year (3rd and 4th semester) alongwith the subject of various pools of courses offered by Food Technology Department i.e. MDC, MIN, SEC, VOC, VAC etc. w.e.f. academic session 2024-25 as per NEP-2020, being run in University Teaching Department, under NEP-2020 on the website of the University. upload
3. OSD to Vice-Chancellor (for kind information of the Vice-Chancellor), GJUST, Hisar.
4. Secretary, Office of the Registrar (for kind information of the Registrar), GJUST, Hisar.

Raj Kumar to upload the 3rd/4th sem. Int. B.Sc M.Sc
[signature] 28/5/25

[signature] 22/5/25
Assistant Registrar (Academic)

Scheme of Examination for Under Graduate Programme

Integrated B.Sc. (Hons./Hons. with Research) -M.Sc. in Food Technology (Semester System)

2nd Year (Semester –III & IV) as per NEP, 2020

(Multiple Entry-Exit, Internship and Choice Based Credit System)

Under Scheme 'C' for UTD

To be implemented w.e.f. Academic Session 2024-25

Subject: Food Technology

Department of Food Technology

Guru Jambheshwar University of Science and Technology, Hisar-125001

Haryana (A+NAAC Accredited State Govt. University)

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

Scheme of Examination for Under Graduate Programme

Subject: Food Technology

SEMESTER-III

Type of Course		Course Code	Nomenclature of Paper/ Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr.)
Discipline Specific Course	DSC-A5	24BFT0301T	Food Engineering	4	4	30	70	100	3 Hr.
	DSC-A6	24BFT0302T/ 24MIC0324T	Technology of Milk and Milk Products	4	4	30	70	100	3 Hr.
Minor Course (MIC)	MIC-3	24MIC0327T	Techniques in Microbiology	4	4	30	70	100	3 Hr.
Multidisciplinary Course (MDC)	MDC-3	24MDC0302T	Positivism, Happiness and Well Being	3	3	25	50	75	2.5 Hr.
		24MDC0306T	Fundamentals of Indian Capital Markets						
		24MDC0310T	Software Engineering						
Ability Enhancement Course (AEC)	AEC-3	24AEC0302T	संचार कौशल	2	2	15	35	50	2 Hr.
Skill Enhancement Course (SEC)	SEC-3	24SEC0316P	Technology of Milk and Milk Products Lab	3	6	25	50	75	3 Hr.
Value Added Course (VAC)	VAC-3	24VAC0301T	Environmental Studies-II	2	2	15	35	50	2 Hr.
		24VAC0306T	Digital Technology						
		24VAC0312T	Chemistry of Food						
			Total Credits	22	25	170	380	550	

Department of Food Technology
Guru Jambheshwar University of
Science & Technology

SEMESTER-IV

Type of Course		Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Discipline Specific Course (DSC)	DSC-A7	24BFT0401T	Technology of Cereals, Pulses and Oilseed Processing	4	4	30	70	100	3 Hr.
	DSC-A8	24BFT0402T	Processing and Preservation of Fruits and Vegetables	3	3	20	50	70	2.5 Hr.
		24BFT0402P	Processing and Preservation of Fruits and Vegetables Lab	1	2	10	20	30	3 Hr.
	DSC-A9	24BFT0403T	Fundamentals of Food Packaging	3	3	20	50	70	2.5 Hr.
		24BFT0403P	Fundamentals of Food Packaging Lab	1	2	10	20	30	3 Hr.
	DSC-A10	24BFT0404T	Unit Operations in Food Processing	4	4	30	70	100	3 Hr.
Vocational Course (VOC)	VOC-I	24VOC0427T	Fundamentals of Immunology	2	2	15	35	50	2 Hr.
		24VOC0427P	Fundamentals of Immunology Lab	2	4	15	35	50	3 Hr.
Ability Enhancement Course (AEC)	AEC-4	24AEC0301T	English for Effective Communication-II	2	2	15	35	50	2 Hr.

Chairperson
Department of Food Technolog
Guru Jambheshwar University
& Technology, Hisa

Value Added Course (VAC)	VAC-4	24VAC0301T	Environmental Studies-II	2	2	15	35	50	2 Hr.
		24VAC0304T	Medical Botany						
		24VAC0310T	Health and Wellness						
		24VAC0314T	Cyber Laws and Ethics						
		24VAC0319T	Logistic Management						
Internship*				4				100	
			Total Credits	24+4	28+120	180	420	600+ 100	

*Note: Internship of 4 Credits of 4 weeks duration after 4th semester (if not done after 2nd semester)

Note: Undergraduate Diploma in Discipline with 94 Credits

Exit Option: Semester III&IV: Undergraduate Diploma in Food Technology with 94 credits

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

Integrated B.Sc. (Hons./Hons. With Research) –M.Sc. in Food Technology (Semester System)
As Per NEP, 2020
(Multiple Entry-Exit, Internship and Choice Based Credit System)
To be implemented w.e.f. Academic Session 2024-25

Subject: Food Technology
Discipline Specific Courses (DSC)

SEMESTER-III

Type of Course		Course Code	Nomenclature of Paper/ Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Discipline Specific Course	DSC-A5	24BFT0301T	Food Engineering	4	4	30	70	100	3 Hr.
	DSC-A6	24BFT0302T/ 24MIC0324T	Technology of Milk and Milk Products	4	4	30	70	100	3 Hr.

4/4/25
Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER-IV

Type of Course		Course Code	Nomenclature of Paper/ Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Discipline Specific Course	DSC-A7	24BFT0401T	Technology of Cereals, Pulses and Oilseeds Processing	4	4	30	70	100	3 Hr.
	DSC-A8	24BFT0402T	Processing and Preservation of Fruits and Vegetables	3	3	20	50	70	2.5 Hr.
		24BFT0402P	Processing and Preservation of Fruits and Vegetables Lab	1	2	10	20	30	3 Hr.
	DSC-A9	24BFT0403T	Fundamentals of Food Packaging	3	3	20	50	70	2.5 Hr.
		24BFT0403P	Fundamentals of Food Packaging Lab	1	2	10	20	30	3 Hr.
	DSC-A10	24BFT0404T	Unit Operations in Food Processing	4	4	30	70	100	3 Hr.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

DSC Syllabi for Under Graduate Programme

Integrated B.Sc. (Hons./Hons. with Research) -M.Sc. in Food Technology (Semester System)

2nd Year (Semester –III & IV) as per NEP, 2020

(Multiple Entry-Exit, Internship and Choice Based Credit System)
Under Scheme 'C' for UTD

To be implemented w.e.f. Academic Session 2024-25

Subject: Food Technology

Department of Food Technology

Guru Jambheshwar University of Science and Technology, Hisar-125001

Haryana (A+NAAC Accredited State Govt. University)

Chairperson
Department of Food Technology
Guru Jambheshwar University of Science & Technology
Hisar

SEMESTER III Food Technology **Course Type: Discipline Specific Course (DSC A5)** **Course Code: 24BFT0301T** **Course Title: Food Engineering** **Category: Theory** **Mode: Lectures (L)** **Hours/week:4+0+0** **Credits: 4** **Examination Duration: 3Hours**	**Course Assessment Methods:** ***Note for Paper Setters:*** **Max. Marks: 100 (Internal: 30; External: 70)** Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. ***Note:*** The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 01. All question shall carry equal marks i.e. 14 marks.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L1	CO1	Describe various physical and rheological properties of food and biomaterials
L2	CO2	Explain thermal properties and flow behaviour of foods
L2	CO2	Understanding the working of various thermal processing equipments
L3	CO3	Solve the problems related to psychrometrics, dielectric, surface and colorimetric properties of foods
L4	CO4	Judge the processing technique to be adopted for various foods according to their properties

UNIT-I

Introduction to food engineering: Present status and scope of food engineering. Units and dimensions. Energy balances and mass balance. Physical properties: shape, size, density bulk density, porosity. Fluid flow theory and application. Viscosity: types of viscosity, newtonian and non-newtonian fluids.

UNIT-II

Thermal properties: Arhenius concept, thermal conductivity, thermal diffusivity, enthalpy, specific heat. Heat exchangers/ evaporators units and dimensions. Thermal processing of foods: concept of D- value, F-value, Z-value, lethality, commercial sterility, 12 D inactivation, Q-10 values, processing methods and equipments (retort).

UNIT-III

Psychrometrics: properties of dry air, water vapour and air vapour mixtures, moisture content, bound water, free water , humidity, relative humidity, humidity ration, sorption isotherm, specific volume, specific heat and enthalpy. Gibbs-Dalton law, dew-point temp, humidity ratio, relative humidity, wet bulb and dry bulb temperature.

UNIT-IV

Refrigeration: Introduction and application. Refrigerants: types and properties. Components of refrigeration cycle. Pressure: enthalpy chart, carnot cycle. Different types of machineries used in refrigeration, tons of refrigeration.

Recommended Readings:

- Singh, R. P., & Heldman, D. R (2014). Introduction to Food Engineering (5th ed.): Academic Press, New Delhi.
- Saravacos, G. D., & Maroulis, Z. B. (2011). Food Process Engineering Operations: CRC Press, Boca raton.
- Toledo, R.T. (2007). Fundamentals of Food Process Engineering (3rd ed.): Springer, New York.
- Gustavo, V. B-C., & Ibarz, A. (2002). Unit Operations in Food Engineering: CRC Press.
- Lozano, J. E (2000). Trends in Food Engineering.

Chairperson
Department of Food Technology
Guru Jambheshwar University of Science & Technology, Hisar

SEMESTER III Food Technology Course Type: Discipline Specific Course (DSC-A6) Course Code: 24BFT0302T Course Title: Technology of Milk and Milk Products Category: Theory Mode: Lectures (L) Hours/week:4+0+0 Credits: 4 Examination Duration: 3Hours	**Course Assessment Methods:** *Note for Paper Setters:* **Max. Marks: 100 (Internal: 30; External: 70)** Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. *Note:* The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 01. All question shall carry equal marks i.e. 14 marks.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L1	CO1	Describe concepts related to the composition, properties, processing and utilization of milk
L2	CO2	Explain milk processing techniques and subsequent manufacturing of milk products
L3	CO3	Use technology for value addition and dairy plant sanitation
L4	CO4	Assess the quality characteristics of various dairy products
L5	CO5	Prescribe processing conditions and new technologies related to dairy sector

UNIT-I

Dairy industry in India: scope, strengths and opportunities for dairy industry. Milk: definition, composition, nutritive value, factors affecting composition of milk. Physico-chemical properties. Milk lipids: chemical properties, fat destabilization, functional properties. Milk proteins: types, casein micellar structure and its aggregation.

UNIT-II

Storage and processing of fluid milk: pasteurization, sterilization, homogenization, UHT processing and aseptic packaging. Technology of condensed and evaporated milk: composition, process of manufacture and defects. Technology of milk powders (WMP, SMP): composition, process of manufacture and defects. Instantization of milk powder.

UNIT-III

Cheese: classification, process of manufacture of cheddar, mozzarella, cottage and processed cheese and defects. Frozen milk products: composition, process of manufacture and defects. Indigenous milk products.

UNIT-IV

Grading of milk and criterion of grading. By-product utilization - importance/need, caseinates, co-precipitates, whey protein concentrate, Dairy plant sanitation - different types of cleansing and sanitizing agents, their applications, cleaning systems.

Recommended Readings:

- Ahmed, Tufail (1997) "Dairy Plant Engineering and Management", Kitab Mahal, Allahabad.
- Kessler, H.G. (1981) "Food Engineering and Dairy Technology", V.A. Kessler, Frcising., Germany.
- Spreer E. (1998) Milk and dairy product technology, Marcel Dekker Inc.
- Smit G. (2003) Dairy processing - improving quality, Woodhead Publishing.
- Hohnson M. & Alford (1987) Fundamentals of dairy chemistry. 2nd edition, CBS Publishers.
- Rajagopal, Roy, S.K. (2014) Milk & milk products technology, BS Publishers.

Chairperson
Department of Food Technology
Guru Jambheshwar University of Science & Te

SEMESTER IV Food Technology **Course Type: Discipline Specific Course (DSC-A7)** **Course Code: 24BFT0401T** **Course Title: Technology of Cereals, Pulses and Oilseeds Processing** **Category: Theory** **Mode: Lectures (L)** **Hours/week:4+0+0** **Credits: 4** **Examination Duration: 3Hours**	**Course Assessment Methods:** ***Note for Paper Setters:*** **Max. Marks: 100 (Internal: 30; External: 70)** Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. ***Note:*** The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 01. All question shall carry equal marks i.e. 14 marks.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L1	CO1	Define importance, composition, nutritive value, properties and processing of major cereals, pulses and oilseeds and their products and by-products
L2	CO2	Classify pulses and oilseeds in terms of their nutritional and anti-nutritional properties
L4	CO3	Demonstrate instrumentation used for oil extraction of oilseeds and other value addition techniques in pulses and oilseeds processing
L5	CO4	Select suitable processes/treatments and their time-temperature combinations for obtaining best quality products with minimum losses

UNIT-I

Current status and future scenario of world wheat production and uses. Criteria of wheat quality and its relation to processing attributes. Wheat milling: general principle, cleaning, conditioning and milling process. Enzymes of wheat and their technological significance.

UNIT-II

Rice grain structure and chemical composition. Milling of rice: modern rice milling unit operations. Factors affecting rice yield during milling. By-products of rice milling and their utilization. Cooking quality of rice. Parboiling of paddy: different methods, their advantages and disadvantages. Rice convenience foods.

UNIT-III

Chemical, technological and nutritional aspects of corn, oats, barley and millets. Wet and dry milling of corn. High fructose corn syrup, Malting, Oats milling, Breakfast cereals, Processing and values addition of millets.

UNIT-IV

Pulses: composition and importance in Indian diet. Dal milling and processing of pulses. Oilseeds: conditioning and oil extraction, expeller pressing and solvent extraction of oil, oil refining, preparation of protein concentrate, isolates and their use in high protein foods.

Recommended readings:

- Khatkar, B.S. (2010). Baking Science and Technology. Arihant Prakashan Pvt Ltd., New Delhi.
- Samuel, A.M. (2014). The Chemistry and Technology of Cereals as Food and Feed: CBSPublication, New Delhi.
- Khan, K. & Shewry, P. R. (2009). Wheat: Chemistry and Technology: St. Paul, U.S.A.
- Champagne, E.T. (2004). Rice: Chemistry and Technology(3rd ed.): AACC, USA.
- Dendy, D. A. V. & Dobraszczyk, B. J. (2001). Cereals and Cereal Products: Chemistry and Technology: Aspen, Maryland.
- Pomeranz, Y. (1998). Wheat: Chemistry and Technology (3rded.): AACC, USA.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

EMESTER IV Food Technology ourse Type: Discipline Specific Course DS(\8) ourse Code: 24BFT0402T ourse Title: Processing and Preservation f Fruits and Vegetables ategory: Theory Mode: Lectures (L) Hours/week:3+0+0 Credits: 3 Examination Duration: 2.5Hours	**Course Assessment Methods:** *Note for Paper Setters:* **Max. Marks: 70 (Internal: 20; External: 50)** Two mid-term exams each of 10 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and attendance will be 05 marks each. *Note:* The end semester examination will be of 50 marks. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 01. All question shall carry equal marks i.e. 12.5 marks.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L2	CO1	Define factor affecting post-harvest physiology, composition, nutritive value and composition of fruits and vegetables
L3	CO2	Evaluate the changes resulted from various processing techniques
L4	CO3	Apply theoretical knowledge of fruits and vegetables at the industrial level to broaden applications by producing value added products
L5	CO4	Create problem solving strategies and methods in accordance with the current and future prospects of fruits and vegetables

UNIT – I

Introduction, History and role of post - harvest technology. Fruits and vegetables- classification, types, structure and composition of fruits and vegetables- chemical composition and nutritive value and importance in our diet, Pre-harvest factors affecting post-harvest quality of fruits and vegetables. Post harvest handling (harvesting, precooling, sorting, grading and packaging) of perishables i e fruits, vegetables

UNIT – II

Physiological development – fruit ripening, respiration, climacteric phenomenon, RQ, role of ethylene, fruit maturity- definition, methods of maturity determination, maturity indices for selected fruits and vegetables, chemical changes during maturation. Methods of storage- controlled atmospheric storage, modified atmospheric storage and hypobaric. Pre-processing treatment and operations: cleaning methods, sorting, grading, peeling and blanching, methods of pre-cooling, minimal processing of fruits and vegetables, packaging of fruits and vegetables.

UNIT – III

Processing technology of jam, jelly and marmalades, fruit preserves and candied fruits, chutneys, pickles, pickling with vinegar and fermentation-sauerkraut, sauces and ketchups, Processing technology of fruit products- unit operations involved in preparation of fruit products.

Recommended Readings:

- Giridharlal, S. and Tandon, G. L. (2009). Preservation of fruits and vegetables. ICAR, New Delhi.
- Srivastava. P., R., and Kumar, S. (2017). Fruit and vegetable preservation - 3rd Edition. International Publishers, Delhi.
- Thompson, A.K., (2003). Fruits and vegetables; Harvesting, handling and storage. Blackwell Publishing.
- Norman. N. P. (1997). Food Science.5thedi. CBS publishers and distributors, New Delhi.
- Hui, Y. H., (2006). Handbook of fruits and fruit processing. Blackwell Publishing.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

EMESTER IV Food Technology ourse Type: Discipline Specific Course DS 8) ourse Code: 24BFT0402P ourse Title: Processing and Preservation of ruits Vegetables Lab ategory: Practical Mode: Lab Practical and Assignments Hours/week:0+0+2 Credits: 1 Examination Duration: 3Hours	**Course Assessment Methods:** *Note for Paper Setters:* **Max. Marks: 30 (Internal: 10; External: 20)** The internal assessment will be based on assignment/quiz/class test etc. and class participation of 05 Marks each. External evaluation will be based on submission of practical records (05 Marks), viva-voce (05 Marks) and lab performance (10 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examinationin association with the internal examiner appointed bythe Chairperson of the Department.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L2	CO1	Remember principles and procedures of qualitative and quantitative analysis of fruits and vegetable
L3	CO2	Understand importance of pre- processing operation to maintain fruits and vegetables quality
L4	CO3	Understand importance of pre- processing operation to maintain fruits and vegetables quality
L5	CO4	Evaluate the changes and problems related to post harvest handling of fruits and vegetables
L6	CO5	Formulate new products and methods for value addition

List of Practicals:

- Orientation to different fruit processing equipments, their functions and uses
- Visual identification of spoilage, and physical analysis of fruits and vegetables
- Determination of moisture, ash
- Determination of Vitamin C
- Estimate the titratable acidity, pH, TSS of fruit and vegetable products
- Preparation of fruit juices, squashes
- Preservation and processing of certain vegetables by drying
- Preparation of tomato ketchup, puree and paste and their preservation
- Preparation of pickles and chutneys
- Preparation of jam, jelly and marmalade
- Blanching of the given sample and assessment of its adequacy
- Visit to local fruit and vegetables processing industries

Recommended readings:

- FSSAI. (2012). Fruits and vegetables products. Manuals of methods of analysis of Foods. Lab manual 5.
- Giridharlal, S. and Tandon, G. L. (2009). Preservation of fruits and vegetables. ICAR, New Delhi.
- Srivastava. P., R., and Kumar, S. (2017). Fruit and vegetable preservation - 3rd Edition. International Publishers, Delhi.
- Thompson, A.K., (2003). Fruits and vegetables; Harvesting, handling and storage. Blackwell Publishing.
- Hui, Y. H., (2006). Handbook of fruits and fruit processing. Blackwell Publishing.

Chairperson
Department of Food Technology
Guru Jambheshwar University of Science & Technology, Hisar

SEMESTER IV Food Technology **Course Type: Discipline Specific Course (DSC-A5)** **Course Code: 24BFT04031** **Course Title: Fundamentals of Food Packaging** **Category: Theory** **Mode: Lectures (L)** **Hours per week:3+0+0** **Credits: 3** **Examination Duration: 2.5 Hours**	*Course Assessment Methods:* *Note for Paper Setters:* *Max. Marks: 70 (Internal: 20; External: 50)* *Two mid-term exams each of 10 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and attendance will be 05 marks each.* *Note: The end semester examination will be of 50 marks. The examiner is required to set seven questions in all. The first question will be compulsory consisting of consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 01. All question shall carry equal marks i.e. 12.5 marks.*

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L1	CO1	Describe the objectives, functions, packaging and recycling of materials use for packaging
L2	CO2	Understand and compare different types and characteristics of packaging materials
L3	CO3	Use and comprehend about different forms of packaging and their types
L4	CO4	Examine shelf life of different food materials using different packaging techniques
L6	CO6	Develop packages of different types of foods

UNIT-I

Introduction to food packaging: types, functions, application and selection criteria. Polymers: introduction, types and classification. Packaging materials: different forms of packaging, rigid, semi-rigid, flexible forms of packaging. Current status, scope and future challenges of packaging materials.

UNIT-II

Paper: Introduction, composition, manufacturing process. Types of papers and paper-based packaging materials. Glass: introduction, manufacturing processes, types. Metal packaging materials: types, characteristics and container making processes.

UNIT-III

Recent advances in food packaging: active packaging, intelligent packaging, modified atmosphere packaging, aseptic packaging, Biodegradable plastics, edible gums and coatings. CA and MA, Retort pouches, Methods of food storage: principles, types, methods and applications. Food Labeling: introduction and types of food labeling.

Recommended Readings:

- Robertson G. L., (2006) Food Packaging: *Principles and Practice*. 2nd edition, Taylor and Francis Group.
- Mattsson B., and Sonesson U., (2000) *Environmentally-friendly food processing* Woodhead Publishing Ltd.
- Ahvenainen R., (2003) *Novel food packaging techniques*. Woodhead Publishing Ltd.

Chairperson
Department of Food Technology
Guru Jambheshwar University of Science & Technology, Hisar

SEMESTER IV Food Technology	Course Assessment Methods:
Course Type: Discipline Specific Course DSC-A9 Course Code: 24BFT0403P Course Title: Fundamentals of Food Packaging Lab Category: Practical Mode: Lab Practical and Assignments Hours per week:0+0+2 Credits: 1 Examination Duration: 3 Hours	*Note for Paper Setters:* Max. Marks: 30 (Internal: 10; External: 20) The internal assessment will be based on assignment/quiz/class test etc. and class participation of 05 Marks each. External evaluation will be based on submission of practical records (05 Marks), viva-voce (05 Marks) and lab performance (10 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed by the Chairperson of the Department.

RBT Level	Course Outcomes: After the completion of the course, the students will be able to:	
L1	CO1	Describe various analytical procedures related to the food packaging
L2	CO2	Classify different types of packaging materials
L3	CO3	Choose the best packaging material as per the product requirement in consideration with environmental concerns
L4	CO4	Evaluate shelf life of packaged foods

List of Practicals:

- Familiarization and study physical characteristics of different types of packages used for packaging of food and food products.
- Study packaging labels and symbols specific to food and food products
- Determination of thickness and GSM of packaging materials
- To find out the water absorptive percentage of test samples of packaging materials
- To determine the adhesive percentage of tapes used in packaging
- To perform physical identification test for plastics films
- Examination of different types of packages and containers
- To perform vacuum packaging and determination of storage life of packaged foods
- To perform leak test on a given packaging sample using vacuum leak tester
- To determination of wax from waxed papers
- Packaging of powder foods and estimation of shelf-life studies of packaged foods
- Packaging of food material in seal and shrink-packaging machine and study its shelf life
- To study different packaging defects

Recommended Readings:

- Robertson G. L., (2006) Food Packaging: Principles and Practice. 2nd edition, Taylor and Francis Group.
- Mattsson B., and Sonesson U., (2000) Environmentally-friendlyfood processing Woodhead Publishing Ltd.
- Ahvenainen R., (2003) Novel food packaging techniques. Woodhead Publishing Ltd.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER-IV Food Technology Course Type: Discipline Specific course Elective DSC-A10 (E) Course Code: 24BFT0404T Course Title: Unit Operations in Food Processing Category: Theory Mode: Lectures (L) Hours per week:4+0+0 Credits: 4 Examination Duration: 3 Hours	Course Assessment Methods: *Note for Paper Setters:* Max. Marks: 100 (Internal: 30; External: 70) Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. *Note:* The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 01. All question shall carry equal marks i.e. 14 marks.

RBT Level	Course Outcomes: After the completion of the course, the students will be able to:	
L1	CO1	Familiar with basic unit operation principles of several food processing operations including materials handling, cleaning, size reduction, thermal processing and non-thermal processing methods
L2	CO2	Learn basic components of different processing equipment and unit operation associated with food processing
L3	CO3	Understand how multiple unit operations are combined into food processes
L4	CO4	Develop food handling practices that reduce risk and increased the potential for operating the equipment in food industry

UNIT – I

Unit operation: Introduction, classification. Cleaning methods and equipments - dry cleaning: screening, aspiration and magnetic cleaning and wet cleaning: soaking, spray washing and flotation washing. Sorting and grading methods and principles of equipments. Peeling and skinning: flash steam, abrasion and flame peeling. Sieving: terminology, types of screens.

UNIT – II

Size reduction- forces, energy requirement by Rittinger law, Kick's law, Bond's law, Size reduction equipments – crusher, grinder, attrition mills, hammer mill, cutting and chopping machines. Size enlargement: extrusion, agglomeration, forming process equipments and their working principle. Homogenizer and centrifuge: working principle and utilization.

UNIT – III

Mixing-equipments – fluid mixers (Paddle agitators, turbine agitators and propeller agitators), dough and paste mixers (pan mixer, horizontal mixer and dough mixer), solids mixers (tumbler mixer & vertical screw mixer). Filtration- feed slurry, filtrate, filter medium, filter cake and filters; Methods/equipments: pressure filtration, vacuum filtration and centrifugal filtration; Expression - hydraulic pressing, roller pressing and screw pressing.

UNIT – IV

Evaporators– open pans, horizontal tube, vertical tube and plate evaporator, single and multiple effect evaporators. Drying equipments-convective dryers, contact dryers, vacuum dryers and freeze dryers. Equipments used for unit operation: blanching, pasteurization, sterilization baking and frying. Food packaging equipments: printers, fillers, form fill seal machine. Material handling and storage equipments– conveyors (belt conveyors, chain conveyors, screw conveyors, pneumatic conveyors), bucket elevators.

Recommended Readings:

- Earle R. L. (1983). Unit Operations in Food Processing, 2nd Edition, Pergamon Press.
- Singh R. P. & Heldman D. R. (1984). Introduction to Food Engineering, Academic Press.
- Toledo R. T. (1980). Fundamentals of Food Process Engineering, AVI Publication.
- Saravacos G. D. and Maroulis Z. B. (2011). Food process engineering operations:
- contemporary food engineering series, CRC Press, Boca Raton.
- Das H. (2005). Food processing operations analysis, Asian Books Publications, New Delhi.
- Berk Z. (2013). Food process engineering and technology, 2nd edition, Academic press, New Delhi.

Chairperson
Department of Food Technology
Guru Jambheshwar University of Science & Technology, Hisar

Integrated B.Sc. (Hons./Hons. With Research) -MSc in Food Technology (Semester System)

As Per NEP, 2020
(Multiple Entry-Exit, Internship and Choice Based Credit System)
To be implemented w.e.f. Academic Session 2024-25

Subject: Food Technology

Pool of Courses offered by Food Technology Department
(MDC, MIN, SEC, VOC, VAC)

SEMESTER-III

Type of Course		Course Code	Nomenclature of Paper/ Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Minor Course (MIC)	MIC-3	24MIC0324T/ 24BFT0302T	Technology of Milk and Milk Products	4	4	30	70	100	3 Hr.
Multidisciplinary Course (MDC)	MDC-3	24MDC0316T	Food Safety and Quality	3	3	25	50	75	2.5 Hr.
Skill Enhancement Course (SEC)	SEC-3	24SEC0316P	Technology of Milk and Milk Products Lab	3	6	25	50	75	3 Hr.
Value Added Course (VAC)	VAC-3	24VAC0317T	Introduction to Nutrition and Health	2	2	15	35	50	2 Hr.

1/4/2025
Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER-IV

Type of Course		Course Code	Nomenclature of Paper/ Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Vocational Course (VOC)	VOC-1	24VOC0424T	Processing and Preservation of Fruits and Vegetables	2	2	15	35	50	2 Hr.
		24VOC0424P	Processing and Preservation of Fruits and Vegetables Lab	2	4	15	35	50	3 Hr.
Value Added Course (VAC)	VAC-4	24VAC0317T	Introduction to Nutrition and Health	2	2	15	35	50	2 Hr.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology Hisar

Syllabi for Pool of Courses (Under Graduate Programme)

Integrated B.Sc. (Hons./Hons. with Research) -M.Sc. in Food Technology
(Semester System)

2nd Year (Semester –III & IV) as per NEP, 2020
(Multiple Entry-Exit, Internship and Choice Based Credit System)
Under Scheme 'C' for UTD

To be implemented w.e.f. Academic Session 2024-25

Subject: Food Technology

Department of Food Technology

Guru Jambheshwar University of Science and Technology, Hisar-125001

Haryana (A+NAAC Accredited State Govt. University)

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER III Food Technology Course Type: Minor Course (MIC-3) Course Code: 24MIC0324T Course Title: Technology of Milk and Milk Products Category: Theory Mode: Lectures (L) Hours/week: 4+0+0 Credits: 4 Examination Duration: 3Hours	**Course Assessment Methods:** ***Note for Paper Setters:*** **Max. Marks: 100 (Internal: 30; External: 70)** Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and class participation will be 10 and 05 marks, respectively. ***Note:*** The end semester examination will be of 70 marks. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt five questions in all selecting one question from each unit in addition to compulsory Question No. 01. All question shall carry equal marks i.e. 14 marks.

RBT Level	**Course Outcomes**: After the completion of the course, the students will be able to:	
L1	CO1	Describe concepts related to the composition, properties, processing and utilization of milk
L2	CO2	Explain milk processing techniques and subsequent manufacturing of milk products
L3	CO3	Use technology for value addition and dairy plant sanitation
L4	CO4	Assess the quality characteristics of various dairy products
L5	CO5	Prescribe processing conditions and new technologies related to dairy sector

UNIT-I

Dairy industry in India: scope, strengths and opportunities for dairy industry. Milk: definition, composition, nutritive value, factors affecting composition of milk. Physico-chemical properties. Milk lipids: chemical properties, fat destabilization, functional properties. Milk proteins: types, casein micellar structure and its aggregation.

UNIT-II

Storage and processing of fluid milk: pasteurization, sterilization, homogenization, UHT processing and aseptic packaging. Technology of condensed and evaporated milk: composition, process of manufacture and defects. Technology of milk powders (WMP, SMP): composition, process of manufacture and defects. Instantization of milk powder.

UNIT-III

Cheese: classification, process of manufacture of cheddar, mozzarella, cottage and processed cheese and defects. Frozen milk products: composition, process of manufacture and defects. Indigenous milk products.

UNIT-IV

Grading of milk and criterion of grading. By-product utilization - importance/need, caseinates, co-precipitates, whey protein concentrate, Dairy plant sanitation - different types of cleansing and sanitizing agents, their applications, cleaning systems.

Recommended Readings:

- Ahmed, Tufail (1997) "Dairy Plant Engineering and Management", Kitab Mahal, Allahabad.
- Kessler, H.G. (1981) "Food Engineering and Dairy Technology", V.A. Kessler, Freising., Germany.
- Spreer E. (1998) Milk and dairy product technology, Marcel Dekker Inc.
- Smit G. (2003) Dairy processing - improving quality, Woodhead Publishing.
- Hohnson M. & Alford (1987) Fundamentals of dairy chemistry. 2nd edition, CBS Publishers.
- Rajagopal, Roy, S.K. (2014) Milk & milk products technology, BS Publishers.
- Early R. (2010) Technology of dairy product, Springer Publishers.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER III Food Technology Course Type: Multidisciplinary Course (MDC-3) Course Code: 24MDC03161 Course Title: : Food Safety and Quality Category: Theory Mode: Lectures (L) Hours/week:3+0+0 Credits: 3 Examination Duration: 2.5 Hours	Course Assessment Methods: Max. Marks: 75 (Internal: 25; External: 50) *Note for Paper Setters:* Two mid-term exams each of 15 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for assignment and attendance will be 05 marks each. *Note:* The end semester examination will be of 50 marks. The examiner is required to set seven questions in all. The first question will be compulsory consisting of consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 01. All question shall carry equal marks i.e. 12.5 marks.

RBT Level	Course Outcomes: After the completion of the course, the students will be able to:	
L1	CO1	Describe concepts related to food quality, safety and their relevance in food industry
L2	CO2	Explain principles and mechanism related to quality management systems
L3	CO4	Assess various factors that affect food quality and safety for obtaining good quality and safe foods
L4	CO5	Prescribe various quality management systems applied to food sector for obtaining good quality foods

UNIT-I

Introduction, concept of food safety and standards; Food hazards and contaminations – biological, chemical and physical factors; GAP, GHP, GMP, HACCP system for food safety: Principles and its applications

UNIT-II

Food Quality control and quality assurance, 5S, six sigma, lean manufacturing, Just in Time (JIT), Kanban, Design of quality control system, Process quality control, attribute control, variables control, control charts, continuous improvement, food traceability and authenticity

UNIT-III

Quality management systems: Total quality management (TQM): Objectives, principles, implementation; quality tools, ISO 9000 standards, FSMS (Food safety management system), GFSI (Global food safety initiative, FSSC 22000 (Food safety system certification), SQF (safe quality food)

Recommended Readings:

- Singh, S. P. (2009). Food Safety, Quality Assurance and Global Trade: Concerns and Strategies: International Book Distributing Co. Lucknow
- Julie, Miller & Jones (1998) Food safety, Association of official analytical chemist USA.
- Rekha, S. &Pushpa, R. (1997). Handbook of Indian Food Quality and authenticity: Woodhead Publishing Ltd., London

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER III Food Technology **Course Type: Skill Enhancement Course (SEC-3)** **Course Code: 24SEC0316P** **Course Title: Technology of Milk and Milk Products Lab** **Category: Practical** **Mode: Lab Practical and Assignments** **Hours per week: 0+0+6** **Credits: 3** **Examination Duration: 3 Hours**	**Course Assessment Methods:** **Max. Marks: 75 (Internal: 25; External: 50)** ***Note for Paper Setters:*** The internal assessment will be based on mid-term exam (10 Marks), assignment/quiz/class test etc. (10 Marks) and class participation of 05 marks. External evaluation will be based on submission of practical records (10 Marks), viva-voce (10Marks) and written exam with lab performance (30 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examination in association with the internal examiner appointed bythe Chairperson of the Department.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L2	CO1	Demonstrate procedures and analytical techniques for milk and milk product testing
L3	CO2	Judge quality of milk and milk products as prescribed by legal authorities
L4	CO3	Detect the presence of inferior quality material in milk and milk products
L5	CO4	Assess method for quality assurance of milk and milk products
L6	CO5	Formulate new milk products with enhanced quality characteristics and nutritional value

List of Practicals:

- Sampling of milk and milk products
- Platform tests of milk: Organoleptic test, Sediment test, COB test, Alcohol test, Alcohol-Alizarin test, Titratable acidity and pH milk
- Determination of specific gravity of milk, total solids and solid-not-fat using lactometer
- Detection of milk adulterants: added water, starch, cane sugar, neutralizers and preservatives (formalin and hydrogen peroxide), synthetic milk (urea test, detergent test, common salt)
- Alkaline phosphatase test to determine adequacy of pasteurization
- Fat estimation in milk using gerber and rose-gottlieb method
- Testing of ghee and butter: Reichert-Meissel number and Polenske value, Moisture in butter (Dean and Stark distillation), curd and salt in butter, Peroxide value, Iodine value of ghee, Acid value of ghee, Saponification value of ghee
- Separation of cream using cream separator
- Development of some indigenous dairy products- Standardization and preparation of khoa/ice cream/Rasogulla
- Visit to a dairy plant/milk-based industry

Recommended Readings:

- FSSAI (2022). Manual of Methods of Analysis of Food Products Dairy and Dairy Products.
- Gandhi, K., Sharma, R., Gautam, P. B., & Mann, B. (2020). Chemical quality assurance of milk and milk products (p. 202). Singapore: Springer.
- Farrington, E. H., & Woll, F. W. (2010). Testing milk and its products. Agrobios (India).
- Khamrui, K. (2012). Practical manual on traditional indian dairy products.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER III Food Technology arse Type: Value Added Course (VAC-3) Course Code: 24VAC0317T Course Title: Introduction to Nutrition and Health Category: Theory Mode: Lectures (L) Hours/week:2+0+0 Credits: 2+0+0 Examination Duration: 2 Hours	**Course Assessment Methods:** **Max. Marks: 50 (Internal: 15; External: 35)** ***Note for Paper Setters:*** Two mid-term exams each of 10 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for class participation will be 05 marks. ***Note:*** The end semester examination will be of 35 marks. The examiner is required to set five questions in all. The first question will be compulsory consisting of five short question covering the entire syllabus consisting of 3 marks each. In addition to that four more questions will be set with two questions from each unit. The students shall be required to attempt three questions in all selecting one question from each unit consisting of 10 marks each in addition to compulsory Question No. 1 consisting of 15 marks.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L1	CO1	Describe the processes of digestion, absorption and metabolism of nutrients and their impact on energy balance
L2	CO2	Classify the nutritional requirements for different life stages and special populations
L3	CO3	Use dietary guidelines and recommendations to assess and plan balanced diets
L5	CO4	Evaluate basic nutritional assessments and understand the principles of food safety and hygiene

UNIT-I

Understanding the basic concepts and the role of nutrition in health. Energy balance: concepts of energy intake and expenditure, basal metabolic rate (BMR). Public Health Nutrition: community nutrition programs, food security and global nutrition challenges.

UNIT-II

Macronutrients: Overview of carbohydrates, proteins and fats; their functions and sources. Micronutrients: nomenclature, classification of vitamins and minerals, sources, their roles, daily requirements and deficiency disease. Role of water and dietary fibre in human health.

Recommended Readings:

- Joshi S. A., (1992) Nutrition and Dietetics Tata Mc Grow- Hill publishing Company Ltd., New Delhi
- M. Swaminathan, Vol I & II Foods and Nutrition NIN Publications.
- Manay S., and Shadksharawamis N., Food: Facts and Principles, New Age International Pvt. Ltd., New Delhi.
- Mann J., and Truswell S., (2007) Essentials of Human Nutrition3rd Ed. Oxford University Press, 2007.
- Khanna (1997) Textbook of Nutrition and Dietitics, Phoenix Publisher House Pvt. Ltd., New Delhi.
- Eastwood M. S., (2003) Principles of Human Nutrition2 ed, Blackwell Publishers.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER IV Food Technology Course Type: Vocational Course VOC-1 Course Code: 24VOC0424T Course Title: Processing and Preservation of Fruits and Vegetables Category: Theory Mode: Lectures (L) Hours/week:2+0+0 Credits: 2 Examination Duration: 2Hours	**Course Assessment Methods:** **Max. Marks: 50 (Internal: 15; External: 35)** ***Note for Paper Setters:*** Two mid-term exams each of 10 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for class participation will be 05 marks. ***Note:*** The end semester examination will be of 35 marks. The examiner is required to set five questions in all. The first question will be compulsory consisting of five short question covering the entire syllabus consisting of 3 marks each. In addition to that four more questions will be set with two questions from each unit. The students shall be required to attempt three questions in all selecting one question from each unit consisting of 10 marks each in addition to compulsory Question No. 1 consisting of 15 marks.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L2	CO1	Define factor affecting post-harvest physiology, composition, nutritive value and composition of fruits and vegetables
L3	CO2	Evaluate the changes resulted from various processing techniques
L4	CO3	Apply theoretical knowledge of fruits and vegetables at the industrial level to broaden applications by producing value added products
L5	CO4	Create problem solving strategies and methods in accordance with the current and future prospects of fruits and vegetables

UNIT – I

Introduction, importance and objectives of post-harvest technology. Fruits and vegetables: definition, classification, types, structures, forms, nutritive value and composition of fruits and vegetables. Pre-harvest factors affecting post-harvest quality of fruits and vegetables. Post harvest handling (harvesting, precooling, sorting, grading and packaging) of perishables i.e. fruits, vegetables. Physiological development: fruit ripening, respiration, climacteric phenomenon, RQ, role of ethylene, fruit maturity: definition, methods of maturity determination, chemical changes during maturation and ripening.

UNIT – II

Various traditional and advanced methods of storage. Pre-processing treatments and operations: cleaning methods, sorting, grading, peeling and blanching, minimal processing of fruits and vegetables, packaging of fruits and vegetables. Processing technology of jam, jelly and marmalades, fruit preserves and candied fruits, chutneys, pickles, pickling with vinegar and fermentation: sauerkraut, sauces and ketchups.

Recommended Readings:

- Giridharlal, S. and Tandon, G. L. (2009). Preservation of fruits and vegetables. ICAR, New Delhi.
- Srivastava. P., R., and Kumar, S. (2017). Fruit and vegetable preservation - 3rd Edition. International Publishers, Delhi.
- Thompson, A.K., (2003). Fruits and vegetables; Harvesting, handling and storage. Blackwell Publishing.
- Norman. N. P. (1997). Food Science.5thedi. CBS publishers and distributors, New Delhi.
- Hui, Y. H., (2006). Handbook of fruits and fruit processing. Blackwell Publishing.

Chairperson
Department of Food Technology
Guru Jambheshwar University of
Science & Technology, Hisar

SEMESTER IV Food Technology	Course Assessment Methods:
Co e Type: Vocational Course (VOC-1) Course Code: 24VOC0424P Course Title: Processing and Preservation of Fruits and Vegetables Lab Category: Practical Mode: Lab Practical and Assignments Hours/week:0+0+4 Credits: 2 Examination Duration: 3Hours	*Note for Paper Setters:* Max. Marks: 50 (Internal: 15; External: 35) The internal assessment will be based on assignment/quiz/class test etc. and class participation of 10 marks and 05 Marks respectively. External evaluation will be based on submission of practical records (05 Marks), viva-voce (10 Marks) and written exam with lab performance (20 Marks). The internal examination will be conducted by the course coordinator. The external examination will be conducted by external examiner appointed by the Controller of Examinationin association with the internal examiner appointed bythe Chairperson of the Department.

RBT Level	Course Outcomes: After the completion of the course, the students will be able to:	
L2	CO1	Remember principles and procedures of qualitative and quantitative analysis of fruits and vegetable
L3	CO2	Understand importance of pre- processing operation to maintain fruits and vegetables quality
L5	CO3	Evaluate the changes and problems related to post harvest handling of fruits and vegetables
L6	CO4	Formulate new products and methods for value addition

List of Practicals:

- Orientation to different fruit processing equipments, their functions and uses
- Visual identification of spoilage, and physical analysis of fruits and vegetables
- Determination of moisture, ash
- Determination of Vitamin C
- Estimate the titratable acidity, pH, TSS of fruit and vegetable products
- Preparation of fruit juices, squashes
- Preservation and processing of certain vegetables by drying
- Preparation of tomato ketchup, puree and paste and their preservation
- Preparation of pickles and chutneys
- Preparation of jam, jelly and marmalade
- Blanching of the given sample and assessment of its adequacy
- Visit to local fruit and vegetables processing industries
- Quality evaluation of canned products and defects of cans

Recommended readings:

- FSSAI. (2012). Fruits and vegetables products. Manuals of methods of analysis of Foods. Lab manual 5.
- Giridharlal, S. and Tandon, G. L. (2009). Preservation of fruits and vegetables. ICAR, New Delhi.
- Srivastava. P., R., and Kumar, S. (2017). Fruit and vegetable preservation - 3rd Edition. International Publishers, Delhi.
- Thompson, A.K., (2003). Fruits and vegetables; Harvesting, handling and storage. Blackwell Publishing.
- Hui, Y. H., (2006). Handbook of fruits and fruit processing. Blackwell Publishing

Chairperson
Department of Food Technology

SEMESTER IV Food Technology Course Type: Value Added Course (VAC-4) Course Code: 24VAC0317T Course Title: Introduction to Nutrition and Health Category: Theory Mode: Lectures (L) Hours/week:2+0+0 Credits: 2+0+0 Examination Duration: 2 Hours	**Course Assessment Methods:** **Max. Marks: 50 (Internal: 15; External: 35)** ***Note for Paper Setters:*** Two mid-term exams each of 10 marks will be conducted for the internal assessment and marks of the best one will be considered. Weightage for class participation will be 05 marks. *Note:* The end semester examination will be of 35 marks. The examiner is required to set five questions in all. The first question will be compulsory consisting of five short question covering the entire syllabus consisting of 3 marks each. In addition to that four more questions will be set with two questions from each unit. The students shall be required to attempt three questions in all selecting one question from each unit consisting of 10 marks each in addition to compulsory Question No. 1 consisting of 15 marks.

RBT Level	**Course Outcomes:** After the completion of the course, the students will be able to:	
L1	CO1	Understand the processes of digestion, absorption and metabolism of nutrients and their impact on energy balance
L2	CO2	Identify the nutritional requirements for different life stages and special populations
L3	CO3	Utilize dietary guidelines and recommendations to assess and plan balanced diets
L4	CO4	Perform basic nutritional assessments and understand the principles of food safety and hygiene

UNIT-I

Understanding the basic concepts and the role of nutrition in health. Energy balance: concepts of energy intake and expenditure, basal metabolic rate (BMR). Public Health Nutrition: community nutrition programs, food security and global nutrition challenges.

UNIT-II

Macronutrients: Overview of carbohydrates, proteins and fats; their functions and sources. Micronutrients: nomenclature, classification of vitamins and minerals, sources, their roles, daily requirements and deficiency disease. Role of water and dietary fibre in human health.

Recommended Readings:

- Joshi S. A., (1992) Nutrition and Dietetics Tata Mc Grow- Hill publishing Company Ltd., New Delhi
- M. Swaminathan, Vol I & II Foods and Nutrition NIN Publications.
- Manay S., and Shadksharawamis N., Food: Facts and Principles, New Age International Pvt. Ltd., New Delhi.
- Mann J., and Truswell S., (2007) Essentials of Human Nutrition3rd Ed. Oxford University Press, 2007.
- Khanna (1997) Textbook of Nutrition and Dietitics, Phoenix Publisher House Pvt. Ltd., New Delhi.
- Eastwood M. S., (2003) Principles of Human Nutrition2 ed, Blackwell Publishers.

Chairperson
Department of Food Techn...
...Jambheshwar Uni...
...ence & Tech...