SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar

NAAC 'A' Grade (10-01-2023 To 09-01-2028)

NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

M. Sc. (Home Science) Food Biotechnology Semester-II

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H02NCFBT01	Recombinant DNA Technology	4-0-1	**120**	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1: Analyze the concept, emergence, and fundamental techniques of recombinant DNA (r-DNA) technology, including DNA cloning, restriction enzymes, cDNA preparation, and oligonucleotide synthesis.

CLO2: Assess various cloning vectors (plasmids, phages, viral vectors) and host systems, along with transformation, transfection methods, and creation and screening of recombinant DNA libraries.

CLO3: Apply techniques for characterization and manipulation of cloned DNA, including gene expression, sequencing, mutagenesis, and heterologous protein production.

CLO4: Analyze molecular techniques such as gel electrophoresis, blotting methods, PCR-based techniques, and advanced genomic tools for DNA amplification, detection, and functional analysis.

CLO5: Evaluate applications of genetic engineering in agriculture, medicine, and industry, including genome analysis, gene therapy, commercial products, and regulatory aspects of GMOs.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	a) Concept and emergence of r-DNA technology b) Generation and cloning of DNA fragment c) (c) Restriction and modification, and enzymes used in r-DNA technology, c-DNA preparation, Oligonucleotide synthesis, Modification of DNA extremities	Classroom lecture, ICT based learning, Case based learning, Seminar	CLO 1
II	Cloning Vectors: a) Plasmids from Escherchia Coli and other microorganisms (B. Subtilis Psuedomonas, Yeast), Mu, M-13 and other animal and plant viral vectors. Specialized vectors (expression, translation vectors etc.) Invitro packaging, Ligation to vector molecules b) Transformation and transfection in bacteria, yeast, fungi, other eukaryotic systems c) Creation and screening library (Recombinant selection)	Classroom lecture, ICT based learning, Case based learning, Seminar, Research-Oriented Learning	CLO 2
III	Characterization of cloned DNA a) Expression of a cloned DNA ,Sequencing of DNA, Gene expression from strong and regulatable promoters b) Fusion protein increasing protein stability c) In vitro mutagenesis, transporon mutagenesis d) Heterologous protein production in eukaryotic cells (e) Maximizing expression of foreign DNA	Classroom lecture, ICT based learning, Case based learning, Seminar search-oriented learning,	CLO 3

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IV	a) Principle of agarose gel electrophoresis, radiolabeling of DNA / RNA, Southern hybridization, Northern and Western blot, Colony and plaque hybridization immune chemical detection, hybrid released and hybrid arrested translation b) Sequencing and amplification of DNA: Nested PCR, AFLP-PCR, Real-time PCR/qpcr , SYBR green assay, Taqman assay, Site directed mutagenesis c) Current status of genome sequencing projects: Introduction to Functional genomics, Microarrays, Serial Analysis of Gene expression (SAGE), Subtractive hybridization, DIGE,TOGA, Yeast Two hybrid Systems, Proteogenomics, Applications of genome analysis and genomics d) Applications of genetic engineering in improvement of plants, animals and microbes; Gene therapy, pharmaceutical products and molecular diagnostics; Marker Assisted Selection; Restriction and regulation for the release of gmos e) (e) Commercial products (Insulin, growth hormones etc.)	Classroom lecture, ICT based learning, Case based learning, Seminar, Reflective Practices	CLO 4, CLO 5

- **Assessment Methodologies**

(A) Internal Assessment

a. Internal Formative assessment

(a) Assignment, Self-learning and Terms work
(b) Seminar/Presentation
(c) Quiz

b. Internal Summative Assessment

(a) Mid-term tests

(B) Weightage of Learning Efforts for External Assessment

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analyse & above (A)	
I	CLO 1	30	1	1	10	12
II	CLO 2	32	1	1	10	12
III	CLO 3	28	1	1	10	12
IV	CLO 4, CLO 5	30	1	1	12	14
		120	**04**	**04**	**42**	**50**

- **Assessment and Evaluation**

Sr. No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	Seminars, Assignments, Quiz, Class Regularity, Internal exam	50
2	End-Semester Examination	Written Exam	50

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(C) CLOs – PLOs Matrix

CLO	PLO											
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO 10	PLO1 1	PLO12
CLO1	3	3	2	1	1	1	2	2	1	1	1	1
CLO2	3	3	2	2	1	1	2	2	1	1	1	1
CLO3	3	3	3	3	2	2	2	2	2	1	1	1
CLO4	2	2	3	3	2	3	3	2	2	2	1	1
CLO5	2	2	3	3	2	2	3	2	2	3	2	2

Values to **CLO-PLO** matrix are assigned **by judging the importance of the particular CLO** in relation to the **PLOs**.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr.No.	Title	Author(s)	Edition/Year	Publisher
1	Principles of gene manipulation.	Primrose, S.B., Twyman, R. M. and Old, R.W.	6th Edition, 2001	Wiley–Blackwell
2	Gene Cloning and DNA Analysis.	Brown, T.A.	7th Edition, 2016	Wiley–Blackwell
3	Molecular Biotechnology: Principles and Applications of Recombinant DNA.	Glick, B.R. and Pasternak, J.J. (2010).	4th Edition, 2010	ASM Press
4	Principles Of Gene Manipulation & Geneomics.	Primrose, S.B. and Twyman, R.M.	7th Edition, 2006	Blackwell Science Publications

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	NPTEL Course on Genetic Engineering and Recombinant DNA Technology (video lectures, notes)	https://nptel.ac.in
2	NCBI – National Center for Biotechnology Information (Genomics, DNA sequencing, PCR, research articles)	https://www.ncbi.nlm.nih.gov
3	HHMI BioInteractive – Interactive resources on gene technology, PCR, cloning, and genomics	https://www.biointeractive.org
4	e-PG Pathshala (INFLIBNET) – Molecular Biology and Biotechnology modules	https://epgp.inflibnet.ac.in

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M. Sc. (Home Science) Food Biotechnology Semester-II

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H02NCFBT02	Nutritional Biotechnology	4-0-1	**120**	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1. Assess the principles and methods of plant tissue culture, development of transgenic plants, and molecular techniques used in detection of food pathogens and GM foods.

CLO2. Describe strategies for enhancing the nutritional quality of foods, including manipulation of carbohydrates, proteins, lipids, vitamins, and minerals, along with applications of animal biotechnology.

CLO3. Apply biotechnological approaches to improve food quality by increasing shelf life, producing functional ingredients (e.g., fructose, fructooligosaccharides), and enhancing food processing techniques.

CLO4. Analyze methods for removal of antinutritional factors and toxic substances, and evaluate the development of value-added food metabolites such as colors, flavors, additives, sweeteners, and bacteriocins.

CLO5. Evaluate and apply the role of enzymes, biosensors, and fermentation technologies in food processing industries, including production of enzyme-based products and fermented foods like beer, wine, vinegar, and cheese.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	a) Principles and methods of plant tissue culture, development of transgenic plants b) Molecular techniques in the detection of food pathogens and GM foods	Classroom lectures, ICT based learning, Case based learning, Seminar, Experiential Learning	CLO 1
II	Enhancing the nutritional quality of foods (a) Manipulation of sucrose and starch content: manipulation of fatty acid composition of oils, enriching with protein content, increasing the content of methionine and lysine in feed storage proteins, increasing the levels of vitamins and minerals (b) Animal biotechnology for increasing meat quality and meat production (c) Increasing the shelf life of fruits (d) Isomerization for the production of high-fructose-corn-syrup), fructose and fructooligosaccharides	Classroom lectures, ICT based learning, Case based learning, Seminar, Reflective Practices, Research-Oriented Learning	CLO 2, CLO 3

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III	(a) Removal or minimization of the antinutritional factors and toxic molecules from foods - phytate, oxalic acid, neurotoxins etc., decreasing the contents of pesticides, herbicides (b) Development of food value metabolites-food colors, food flavours, food additives, sweeteners etc. (c) Bacteriocin - a probiotic trait	Classroom lectures, ICT based learning, Case based learning, Seminar, Reflective Practices Research-Oriented Learning	CLO 4
IV	(a) Enzymes in food processing: fermentative production of enzymes (amylases, proteases, cellulases, pectinases, xylanases, lipases) used in food industry and their downstream processing (b) Enzymes as processing aids: Role of enzymes in cheese making and whey processing; fruit juices (cell wall degrading enzymes for liquefaction, clarification, peeling, debittering, decolourization of very dark coloured juices such as anthocyanases); baking (fungal α-amylases for bread making; maltogenic α-amylases for anti-staling; xylanses and pentosanases as dough conditioners; lipases for dough conditioning (c) Biosensors in foods (d) Manufacture of beer, wine, vinegar, cheese, and mold-modified foods	Classroom lectures, ICT based learning, Case based learning, Seminar, Reflective Practices Experiential Learning	CLO 5

- **Assessment Methodologies**

(A) Internal Assessment

a. Internal Formative assessment

(a) Assignment, Self-learning and Terms work
(b) Seminar/Presentation
(c) Quiz

b. Internal Summative Assessment

(a) Mid-term tests

(B) Weightage of Learning Efforts for External Assessment

Unit	Aligned COs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analyse & above (A)	
I	CLO 1	30	1	1	10	12
II	CLO 2, CLO 3	32	1	1	10	12
III	CLO 4	28	1	1	10	12
IV	CLO 5	30	1	1	12	14
		120	**04**	**04**	**42**	**50**

M. Sc. (Home Science) Food Biotechnology Semester-II

- **Assessment and Evaluation**

Sr.No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	Seminars, Assignments, Quiz, Class Regularity, Internal exam	50%
2	End-Semester Examination	Written Exam	50%

(C) CLOs – PLOs Matrix

CLO	PLO											
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO 10	PLO11	PLO 12
CLO1	3	3	2	1	1	1	2	2	1	1	1	1
CLO2	3	3	2	2	1	1	2	2	1	1	1	1
CLO3	3	3	3	3	1	1	2	2	2	1	1	1
CLO4	2	2	3	3	2	2	3	2	2	2	1	1
CLO5	2	2	3	3	2	2	2	2	2	2	1	2

Values to **CLO-PLO** matrix are assigned **by judging the importance of the particular CLO** in relation to the **PLOs**.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr.No.	Title	Author(s)	Edition/Year	Publisher
1	Food and Nutritional Biotechnology.	Ruth, S.K	1st Edition, 2009	Navyug Publishers & Distributors
2	Advances in Food Biotechnology.	Rai, R.V.	1st Edition, 2015	Wiley-Blackwell
3	Biotechnology and Nutrition: Proceedings of the Third International Symposium.	Bills, D.D. and Kung, S.	1992	Butterworth-Heinemann
4	Enzymes in Food Processing: Fundamentals and Potential applications	Edited by P.S. Panesar, S.S. Marwaha, H.K. Chopra	2010	I.K. International Publishing House Pvt. Ltd.
5	Food Biotechnology Principle and Practices	Edited by V.K. Joshi and R.S. Singh	2013	I K International Publishing House Pvt.Ltd.

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	NPTEL Course on Food Biotechnology (Lectures, notes, videos)	https://nptel.ac.in
2	FAO (Food and Agriculture Organization) – Food Biotechnology resources, food safety and nutrition	https://www.fao.org
3	WHO – Food safety, GM foods, and biotechnology guidelines	https://www.who.int
4	e-PG Pathshala (INFLIBNET) – Food Biotechnology study materials	https://epgp.inflibnet.ac.in

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M. Sc. (Home Science) Food Biotechnology Semester-II

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H02NCFBT03	Food Processing Technology	4-0-1	**120**	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1. Explain the principles and status of the food processing industry, and relate them to traditional Indian food processing practices and government initiatives promoting indigenous technologies.

CLO2. Demonstrate comprehensive understanding of traditional and modern processing techniques across major food groups (flesh foods, cereals, legumes, oilseeds, milk, fruits, and vegetables).

CLO3. Analyse the role of traditional and modern processing methods and equipment in enhancing food quality, safety, shelf life, and value addition.

CLO4. Evaluate the impact of traditional and modern food processing on nutritional quality, including nutrient losses and fortification strategies.

CLO5. Apply knowledge of modern food processing and packaging technologies to address industry challenges and improve food preservation and distribution.

Unit	Course Content	Learning Pedagogies*	CO(s)
I	a) Basic issues of the food processing industry, Basic problems of the food processing industry, present status, status of food processing technology, growth trend and growth strategy, Govt. policies and programmes for food processing industry b) Traditional Indian food processing and preservation methods (sun-drying, smoking, salting) c) Flesh foods: Meat processing, processed meat products, poultry processing, dried egg powder, fish processing, fish meal	Classroom lectures, ICT enabled learning, seminar, case based learning	CLO1, CLO2
II	a) Processing of cereal grains: Milling process of rice, milling process of wheat, milling of cereals and legumes, breakfast cereals, pasta products, rice flakes, puffed rice, bakery product processing, maize processing- starch preparation, puffed maize; fermentation of cereals, nutrient loss during processing, fortification etc . b) Legume, oil seed processing: Processing steps, equipments, soya flour processing texturized soya protein foods, legume flour preparation, other legume based products c) Traditional Indian cereal and pulse processing methods (hand pounding, traditional milling, germination, fermentation, earthen pot cookery, cooking on chula, coal, etc.) and its role in enhancing nutritional quality	Classroom lectures, ICT enabled learning, seminar, case based learning Industrial visit	CLO2, CLO3

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III	Processing of milk and milk products: a) Pasteurization and sterilization of milk, different types of milk and its processing, milk powder, processing steps and machinery, cheese processing steps and machinery, butter processing steps and machinery, b) Use of *bilona* method for ghee preparation and its nutritional significance c) Nutrient loss during processing, fortification of processed milk for infant food	Classroom lectures, ICT enabled learning, seminar, case based learning Industrial visit, Collaborative Learning	CLO2, CLO3, CLO4
IV	a) Processing of fruits and vegetables: Dehydration of fruits and vegetables, different methods of dehydration, canning, processing steps, equipment, nutrient losses during processing. b) Packaging: New trends in of packaging, packaging for specific foods in detail	Classroom lectures, ICT enabled learning, seminar, case based learning, Industrial visit	CLO2, CLO4, CLO5

- **Assessment Methodologies**

(A) Internal Assessment

a. Internal Formative assessment

(a) Assignment, Self-learning and Terms work
(b) Seminar/Presentation
(c) Quiz

b. Internal Summative Assessment

(a) End of Term Examination

(B) Weightage of Learning Efforts for External Assessment

Unit	Aligned COs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Analyse & above (A)	
I	CLO1, CLO2	25	1	1	10	**12**
II	CLO2, CLO3	35	1	1	11	**13**
III	CLO2, CLO3, CLO4	30	1	1	11	**13**
IV	CLO2, CLO4, CLO5	30	1	2	10	**12**
		120	**04**	**04**	**42**	**50**

- **Assessment and Evaluation**

Sr.No	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	Seminars, Assignments, Quizzes, Class Regularity, Internal exam	50%
2	End-Semester Examination	Written Exam	50%

M. Sc. (Home Science) Food Biotechnology Semester-II

(C) CLO – PLO Matrix

CLO \ PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	2	-	-	-	-	-	-	1	2	1
CLO2	3	3	3	2	-	-	-	-	1	1	2	1
CLO3	2	3	3	3	1	2	1	-	2	1	2	1
CLO4	2	2	3	3	2	3	2	1	2	2	2	1
CLO5	2	2	3	3	3	3	2	2	3	2	2	2

Values to **CLO-PLO** matrix are assigned **by judging the importance of the particular CLO** in relation to the **PLOs**.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr.No	Title	Author(s)	Edition/Year	Publisher
1	Food Processing Technology: Principles and Practices	P. J. Fellow	Second Edition 2005	CRC Publishers
2	Outline of Dairy Technology	Sukumar, D.	2019	Oxford University Press
3	Cereal Processing & Nutritional Quality.	Sewa Ram & Mishra, B.	2010	New India Publishing Agency,New Delhi.
4.	Food Packaging	Neelam Khetarpaul & Darshan Punia	2008	Daya Publishing House, New Delhi
5	Food Packaging	Neelam Khetarpaul & Darshan Punia	2008	Daya Publishing House, New Delhi

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	Food Technology	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=iWHzbXYGExXDS52DSnAzdQ==
2	Food standards and Regulation	https://www.fssai.gov.in/
3	Springer Open / SpringerLink – Open-access chapters and academic resources related to food chemistry	https://link.springer.com
4	Open Library – Free access to academic books, research papers, and food science materials	https://openlibrary.org

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M. Sc. (Home Science) Food Biotechnology Semester-II

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course credits
			L-P-T		
DSC	P2H02NCFBT04	Practical based on Recombinant DNA Technology and Nutritional Biotechnology	0-8-1	**120**	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1. Apply molecular biology techniques for plasmid isolation, DNA separation, and analysis, including alkaline lysis and agarose gel electrophoresis.

CLO2.Demonstrate and analyze advanced genetic engineering techniques such as plasmid amplification, competent cell preparation, transformation, blotting, mutagenesis, DNA sequencing, and microarray analysis.

CLO3. Perform plant biotechnology and biochemical techniques including micropropagation, plant DNA isolation (CTAB method), and estimation of biomolecules (starch, protein, ascorbic acid).

CLO4. Analyze and apply food biotechnology processes including enzyme assays, fermentation, bacteriocin production, food preservation, enzyme applications, and dairy product preparation.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	a) Plasmid isolation. (i) Mini preparation with 2ml (ii) Mini preparation with 5ml b) Alkaline lysis method separates plasmid DNA from chromosomal DNA c) Agarose Gel Electrophoresis of Digested DNA Separation of DNA fragments based on size	Laboratory practical, demonstration,	CLO1
II	a) Large scale plasmid preparation using chloramphenicol amplification b) Preparation of Competent Cells & Transformation c) Southern Blotting (Demonstration/Simulation) d) Site-directed mutagenesis (demo) e) DNA sequencing (demonstration) f) Microarray analysis (theoretical/demo)	Laboratory practical, demonstration,	CLO2
III	a) Micropropagation using explants (e.g., leaf/nodal segment) b) Isolate genomic DNA from plant tissue (CTAB method) c) Quantify starch levels (Iodine colorimetric method) d) Determine protein concentration (Lowry / Bradford method) e) Estimate ascorbic acid (Titration using DCPIP) Removal of Antinutritional Factors Reduce phytates or oxalates (Soaking/fermentation treatment)	Laboratory practical, demonstration	CLO3

IV	a) Measure Enzyme Activity Assay (Amylase) Starch hydrolysis assay b) Measure Fermentation for Food Product (e.g., Vinegar or Curd) c) Bacteriocin production and testing (antimicrobial assay) d) Fruit shelf-life extension study (coating or storage conditions) e) Enzyme use in fruit juice clarification (pectinase treatment) f) Cheese making using rennet enzyme	Laboratory practical, demonstration,	CLO4

- **Assessment Methodologies**
  - **(A) Internal Assessment**
    - **a. Internal Formative assessment**
      - (a) Class Regularity
      - (b) Laboratory performance
    - **b. Internal Summative Assessment**
      - (a) Internal practical exam
  - **(B) Weightage of Learning Efforts for External Assessment**

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analyse & above (A)	
I	CLO1	30	1	1	11	13
II	CLO2	30	1	1	10	12
III	CLO3	30	1	1	10	12
IV	CLO4	30	1	1	11	13
		120	**04**	**04**	**42**	**50**

M. Sc. (Home Science) Food Biotechnology Semester-II

- **Assessment and Evaluation**

Sr.No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	Class Regularity, Active participation in executing practicals, Internal practical exam	
2	End-Semester Examination	Written and Practical Exam	

(C) CLOs – PLOs Matrix

CLO	PLO											
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	3	0	2	2	0	0	2	0	0	2
CLO2	3	3	3	2	3	3	2	1	2	2	0	2
CLO3	3	3	3	2	2	2	1	1	2	1	1	2
CLO4	3	3	3	3	2	3	2	2	2	2	2	2

Values to **CLO-PLO** matrix are assigned **by judging the importance of the particular CLO** in relation to the **PLOs**.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr.No.	Title	Author(s)	Edition/Year	Publisher
1	Molecular Cloning: A Laboratory Manual	Michael R. Green & Joseph Sambrook	4th Edition, 2012	Cold Spring Harbor Laboratory Press
2	Microbiology: A Laboratory Manual	James G. Cappuccino & Natalie Sherman	11th Edition, 2017	Pearson
3	Plant Tissue Culture: Theory and Practice	S.S. Bhojwani & M.K. Razdan	Revised Edition, 2004	Elsevier
4	Biochemical Methods	Sadasivam & Manickam	3rd Edition, 2008	New Age International

- **Online Resources (Open Source)**

Sr.No.	Description of Resource(s)	Weblink
1	Virtual Labs for Biotechnology & Microbiology practicals (DNA isolation, electrophoresis, etc.)	https://vlab.amrita.edu
2	NPTEL courses on Biotechnology, Molecular Biology, and Food Technology	https://nptel.ac.in
3	Open-access protocols for molecular biology and lab techniques	https://www.protocols.io
4	Educational videos for lab techniques (DNA extraction, PCR, gel electrophoresis, etc.)	https://www.youtube.com (NPTEL, Learn Microbiology)

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M. Sc. (Home Science) Food Biotechnology Semester-II

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H02NCFBT05	Practical based on Food Processing Technology and Food Analysis	0-8-1	**120**	04

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1. Evaluate quality parameters of dairy and plant-based food products (flavoured milk, groundnut milk, soybean milk, paneer, ghee, butter).

CLO2. Demonstrate the development of value-added food products such as paneer, cheese, khoa, bakery items (bread, cake, biscuits), and fruit products (jam, jelly, ketchup), and evaluate their quality parameters.

CLO3. Estimate proximate composition of foods including moisture, fat, carbohydrates, protein and fibre using standard analytical methods. Determine bioactive components such as pigments, vitamins, minerals and antioxidant compounds in food samples.

CLO4. Analyse functional properties of food powders including water holding capacity, oil absorption capacity and bulk density. Evaluate food additives and interpret analytical results in relation to food quality and safety.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	a) Market survey of different processed foods available in the market b) Preparation of flavoured milk, and analysis of pH, Titratable acidity, moisture, total solids, and lactose content c) Preparation of groundnut milk and soyabean milk paneer and physicochemical analysis d) Analysis of ghee and butter- moisture, Free fatty acid, pH, titratable acidity	Laboratory Practicals, Market survey	CLO1, CLO2
II	a) Preparation of paneer, green cheese, khoa and evaluation of physicochemical parameters such as pH, Titrable acidity, and moisture b) Preparation of bread, cake and biscuits e) Preparation of jam, jelly and ketchup	Laboratory Practicals	CLO1, CLO2
III	a) Estimation of moisture; fat constants (TBA, fat content); carbohydrates (lactose, reducing sugar, dietary fibre, crude fibre, total carbohydrate); protein (nitrogen analysis, methionine) b) Estimation of moisture; fat constants (TBA, fat content); carbohydrates (lactose, reducing sugar, dietary fibre, crude fibre, total carbohydrate); protein (nitrogen analysis, methionine)	Laboratory Practical	CLO3, CLO4

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IV	a) Pigments (bixin, carotenoids, chlorophyll); vitamin C; mineral content; functional properties (WHC, OAC, bulk density, tapped density); antioxidant content (BHA, BHT)	Laboratory Practical	CLO3, CLO4

- **Assessment Methodologies**
  - **(A) Internal Assessment**
    - **a. Internal Formative assessment**
      - (a) Class Regularity
      - (b) Laboratory performance
    - **b. Internal Summative Assessment**
      - (a) Internal practical exam

(B) Weightage of Learning Efforts for External Assessment

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analyse & above (A)	
I	CLO1, CLO2	30	1	1	11	13
II	CLO1, CLO2	30	1	1	10	12
III	CLO3, CLO4	30	1	1	11	13
IV	CLO3, CLO4	30	1	1	10	12
		120	**04**	**04**	**42**	**50**

- **Assessment and Evaluation**

Sr.No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	Class Regularity, Active participation in executing practicals, Internal practical exam	50%
2	End-Semester Examination	Written and Practical Exam	50%

(C) CLO – PLO Matrix

CLO \ PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	3	2	-	2	-	-	3	1	1	1
CLO2	3	3	3	3	1	2	1	1	3	1	1	1
CLO3	3	3	3	2	2	3	1	-	3	1	-	-
CLO4	2	2	3	3	2	3	2	1	3	2	1	1

Values to **CLO-PLO** matrix are assigned **by judging the importance of the particular CLO** in relation to the **PLOs**.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr.No.	Title	Author(s)	Edition/Year	Publisher
1	Food Analysis	S. Suzanne Nielsen	5th Edition, 2017	Springer
2	Biochemical Methods	S. Sadasivam & A. Manickam	3rd Edition, 2008	New Age International Publishers
3	A Manual of Laboratory Techniques	National Institute of Nutrition (NIN), Hyderabad	2nd Edition, 2003	ICMR–NIN
4	Official methods of analysis of AOAC International.	AOAC International	2005	AOAC International

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Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H02NCFBT06	Bhartiya Knowledge System in Home Science	2-0-1	**60**	02

- **Course Learning Outcomes (CLOs)**

On completion of this course, students will be able to:

CLO1. Explain and interpret Bhartiya knowledge system in food, health, and family life, including Ahara, Ritucharya, and Pathya–Apathya.

CLO2. Analyze Bhartiya knowledge system–based indigenous foods and nutritional practices, including regional diets and millets for health and sustainability.

CLO3. Examine and evaluate Bhartiya knowledge system in indigenous clothing and traditional household management for sustainable living.

CLO4. Assess and apply Bhartiya knowledge system through folk media for community education, cultural preservation, and knowledge dissemination.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	a) Traditional Knowledge Systems in Food, Health, and Family Life: Concept of Ahara (diet) in traditional Indian systems, Ritucharya and Dinacharya: Seasonal and daily dietary/lifestyle practices, Pathya–Apathya: Do's and don'ts in diet for health and disease b) Indigenous Foods and Nutritional Practices of India: Diversity of regional and traditional Indian diet, Millets and underutilized grains (ragi, bajra, jowar) and their nutritional significance c) Parenting and Family Life in Bhartiya Pranali: Concept of Brahmacharyashrama, Grihasthashrama, Vanaprasthashrama, Sannyasashrama and its role in family life, Samskaras (Garbhadhana to Annaprashana, Vidyarambha) and child developmentImportance of Indian storytelling (Panchatantra, Jataka tales) in value education, Role of grandparents in transmission of culture and knowledge	Classroom lecture, ICT-enabled learning, Case based learning, Experiential learning	CLO1, CLO2
II	a) Indigenous Clothing Practices and Sustainability: Role of indigenous knowledge systems in Textile sustainability, Cultural preservation through traditional embroidery and designing practices b) Traditional Household Management Practices in India: Traditional ways of managing household resources (food, water, energy), Role of family members, especially *Gruhini*, in managing the home sustainably,	Classroom lecture, ICT-enabled learning, Case based learning, Expiriential learning	CLO3, CLO4

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	Traditional practices of reuse, recycling, and reducing waste, Comparison between traditional and modern household management practices c) Folk Media and Community Education in India: Concept, importance of traditional forms (songs, dance, theatre, puppetry, Bhavai, role play etc), Folk media as a tool for community education and awareness, Cultural values and knowledge transmission through folk media, Relevance in present-day community development		

- **Assessment Methodologies**

(A) Internal Assessment

a. Internal Formative assessment

(a) Assignment, Self-learning and Terms work
(b) Seminar/Presentation
(c) Quiz

b. Internal Summative Assessment

(a) Mid-term tests

(B) Weightage of Learning Efforts for External Assessment

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	Application/ Analyse & above (A)	
I	CLO1, CLO2	30	1	1	11	13
II	CLO3, CLO4	30	1	1	10	12
		60	**02**	**02**	**21**	**25**

- **Assessment and Evaluation**

Sr.No.	Assessment/Evaluation	Component	Weightage (%)
1	Continuous Internal Evaluation	Seminars, Assignments, Quiz, Class Regularity, Internal exam	50
2	End-Semester Examination	Written Exam	50

(C) CLOs – PLOs Matrix

CLO \ PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	2	1	1	1	1	2	1	2	3	2
CLO2	3	3	3	2	1	1	2	2	1	2	3	2
CLO3	3	3	3	3	1	1	2	2	2	2	3	2
CLO4	2	3	3	3	1	1	2	3	3	2	3	2

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Values to **CLO-PLO** matrix are assigned **by judging the importance of the particular CLO** in relation to the **PLOs**.

CLO – PLO correlation	Value
Strong	3
Moderate	2
Low	1
No correlation	-

- **Suggested Learning Materials Books:**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Handbook of Ayurveda and Nutrition	Priti Rishi Lal		Elite Publishing
2	Diet and Nutrition: An Ayurvedic Approach	Monika Luharia, Suraj Saries, Rashmi Barsagade, Anurag, Luharia		IP Innovative Publication Ltd., New Delhi
3	Handloom and Handicrafts of India	Jasleen Dhamija	2004	Abhinav Publications
4	Textiles of India	Herbert Ponder	1990	Taraporevala
5	Household Management	B. S. Khatkar	Latest edition	Daya Publishing

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	Traditional Folk Media	https://www.igntu.ac.in/eContent/MJMC-4sem-Dr.Manisha%20Sharma.pdf
2	Traditional and Folk Media for Development	https://ebooks.inflibnet.ac.in/hsp13/chapter/traditional-and-folk-media-for-development/
3	Folk And Traditional Media	https://egyankosh.ac.in/bitstream/123456789/78600/1/Unit-10.pdf
4	Ayurveda and food	https://ayush.gov.in/

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