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) Foods and Nutrition Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H01NCFDN01	Principles and Applications of Instruments and Techniques	4-0-1	**120**	04

- **Course Learning Outcomes (CLOs)**

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

CLO1. Analyze and evaluate the underlying principles of principles of spectroscopic techniques including colorimetry, photometry, fluorimetry, atomic absorption and IR spectroscopy used in food and nutrition analysis.

CLO2. Explain the principles and applications of chromatographic techniques such as paper chromatography, TLC, HPTLC, GC and HPLC.

CLO3. Apply electrophoretic and separation techniques (PAGE, SDS-PAGE, agarose gel electrophoresis) in biochemical and food analysis.

CLO4. Analyse the working principles and applications of modern analytical instruments including ELISA, PCR, RT-PCR, centrifuge, texture analyzer and electron microscope.

CLO5. Evaluate the role of analytical instruments in qualitative and quantitative assessment of food components and research applications.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Spectroscopy: Colorimetry, photometry, fluorimetry, atomic absorption spectroscopy, spectrophotometry, infrared spectroscopy and applications	Classroom lecture, ICT-enabled learning	CLO1
II	Chromatography: Principles, Paper chromatography, TLC, HPTLC, Column chromatography, Gas chromatography (GC), High Performance Liquid Chromatography (HPLC)	Classroom lecture, Problem-based learning	CLO2
III	Electrophoresis & Instruments: PAGE, SDS-PAGE, 2D electrophoresis, agarose gel electrophoresis; Instruments – texture analyzer, food color measurement, isotope techniques, microtome, centrifuge	Classroom lecture, Seminar	CLO3, CLO4
IV	Advanced Techniques: ELISA, PCR, RT-PCR, gel documentation system, pH meter, titration, electron microscope, computer applications in analysis	Classroom lecture, ICT-enabled learning, Seminar	CLO4, CLO5

- **Assessment Methodologies**

M.Sc. (Home Science) Foods and Nutrition Semester-I

(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	30	1	1	11	13
II	CLO2	32	1	1	10	12
III	CLO3, CLO4	28	1	1	10	12
IV	CLO4, CLO5	30	1	1	11	13
		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

(C) CLOs – PLOs Matrix

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

M.Sc. (Home Science) Foods and Nutrition Semester-I

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	Suzanne S. Nielsen	5th Edition, 2017	Springer
2	Principles of Instrumental Analysis	Douglas A. Skoog, F. James Holler, Stanley R. Crouch	6th Edition, 2007	Brooks/Cole (Cengage Learning)
3	Handbook of Analysis of Active Compounds in Functional Foods	Leo M.L. Nollet, Fidel Toldrá	1st Edition, 2012	CRC Press (Taylor & Francis)
4	Thin Layer Chromatography: A Laboratory Handbook	Egon Stahl, M.R.F. Ashworth	2nd Edition, 1990	Springer
5	Non-destructive Evaluation of Food Quality	K. Irudayaraj, C. Joseph	1st Edition, 2013	Wiley-Blackwell
6	Handbook of Dairy Foods Analysis	Leo M.L. Nollet	1st Edition, 2014	CRC Press (Taylor & Francis)

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	e-PG Pathshala modules on Food Analysis and Instrumentation	https://epgp.inflibnet.ac.in
2	Spectrophotometry and analytical techniques (ScienceDirect resources)	https://www.sciencedirect.com
3	Journal of Chromatography B (Research articles on separation techniques)	https://www.sciencedirect.com/journal/journal-of-chromatography-b
4	FAO guidelines on food analysis and quality control methods	https://www.fao.org

M.Sc. (Home Science) Foods and Nutrition Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H01NCFDN02	Basic Biochemistry	4-0-1	**120**	04

- **Course Learning Outcomes (CLOs)**

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

CLO1. Analyze and compare the structure and functions of prokaryotic and eukaryotic cells, including their cellular organelles and division process.

CLO2. Explain the chemistry and metabolic pathways of carbohydrates and their role in energy metabolism.

CLO3. Discuss the chemistry, classification, and metabolism of lipids in relation to physiological functions.

CLO4. Analyse the structure, function, and metabolism of proteins along with enzyme classification, kinetics, and regulation.

CLO5. Evaluate the integration of metabolic pathways and their relevance to nutritional disorders and physiological regulation.

Unit	Course Content	Learning Pedagogies	CLO(s)
I	Cell Biology: Prokaryotic vs eukaryotic cells, cell membrane, structure and functions of organelles, cell division (mitosis, meiosis), differentiation, proliferation, cell fractionation	Classroom lecture, ICT enabled learning	CLO1
II	Carbohydrates: Structure, classification, digestion, absorption, metabolism (glycolysis, TCA cycle, glycogenesis, glycogenolysis)	Classroom lecture, ICT enabled learning, Case based learning, Seminar	CLO2
III	Lipids: Classification, structure, digestion, absorption, β-oxidation, lipid metabolism, physiological roles	Classroom lecture, ICT enabled learning, Case based learning, Seminar	CLO3
IV	Proteins & Enzymes: Amino acids, protein structure, metabolism; enzymes – classification, properties, kinetics, inhibitors, coenzymes, isoenzymes	Classroom lecture, ICT enabled learning Research-oriented learning, Seminar	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) 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	30	1	1	11	13
II	CLO2	32	1	1	10	12
III	CLO3	28	1	1	10	12
IV	CLO4, CLO5	30	1	1	11	13
		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

(C) **CLOs – PLOs Matrix**

CLO \ PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	2	-	-	-	-	-	-	-	-	-
CLO2	3	3	3	-	-	-	-	-	-	-	-	-
CLO3	3	3	3	-	-	-	-	-	-	-	-	-
CLO4	2	3	3	2	2	2	1	-	1	-	-	-
CLO5	2	2	3	3	2	3	2	1	1	1	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	Lippincott's Illustrated Reviews: Biochemistry	Richard A. Harvey, Pamela C. Champe, Denise R. Ferrier	7th Edition, 2019	Wolters Kluwer
2	Textbook of Biochemistry for Medical Students	D. M. Vasudevan, S. Sreekumari, Kannan Vaidyanathan	8th Edition, 2016	Jaypee Brothers
3	Lehninger Principles of Biochemistry	David L. Nelson, Michael M. Cox	6th Edition, 2017	W.H. Freeman
4	Essentials of Biochemistry	Pankaja Naik	2nd Edition, 2017	Jaypee Brothers
5	Biochemistry	Jeremy M. Berg, John L. Tymoczko, Gregory J. Gatto Jr., Lubert Stryer	8th Edition, 2015	W.H. Freeman

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	e-PG Pathshala – Biochemistry Modules	https://epgp.inflibnet.ac.in
2	NPTEL Biochemistry Courses	https://nptel.ac.in
3	Khan Academy – Biochemistry	https://www.khanacademy.org
4	PubMed – Biochemistry Research Articles	https://pubmed.ncbi.nlm.nih.gov

M.Sc. (Home Science) Foods and Nutrition Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H01NCFDN03	Physiology and Clinical Biochemistry	4-0-1	**120**	04

- **Course Learning Outcomes (CLOs)**

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

CLO1. Analyze and evaluate the composition of blood and its role in physiological homeostasis, and correlate it with the concept of Rakta Dhatu and traditional approaches to immunity (Vyadhikshamatva)

CLO2. Explain the anatomy and physiology of the heart and circulatory system, including regulation of heart rate, blood pressure, and interpretation of electrocardiogram (ECG).

CLO3. Analyze and evaluate the physiology of respiration and its regulation, and interpret its relationship with Prana Vayu and the impact of Pranayama practices on respiratory function.

CLO4. Examine and evaluate the digestive and excretory systems, including key processes and regulation, correlate them with the concepts of Tridosha and assess related disorders and diagnostic tools

Unit	Course Content	Learning Pedagogies*	CO(s)
I	a) Blood: Composition, properties, functions, blood group, Rakta Dhatu b) RBC: Genesis, factors affecting its Genesis c) Haemoglobin: Synthesis and types d) WBC: Genesis, body's resistance to infections, inflammation, phagocytosis, antibodies, immunity , concept of *Vyadhikshamatva* e) Platelets: Blood clotting mechanism f) Disorders of the above blood components and their diagnostic tools	Classroom lecture, ICT based learning, Seminar Case based learning, Problem based learning	CLO1
II	a) The Heart: Anatomy, working, control of heart rate,	Classroom lecture, ICT	CLO2

	Electrocardiogram b) Circulation: Blood flow, blood pressure and factors maintaining it, blood vessels and tissue fluids c) Disorders of the cardiovascular system and their diagnostic tools	based learning, Seminar Case based learning, Problem based learning	
III	a) Respiration: Physiology of respiration, exchange of gases, regulation of respiration- chemical and nervous mechanism and effect of altitude on respiration b) Pranayama techniques (e.g., Anulom Vilom, Bhastrika) and their effect on lung function c) Disorders of respiratory system and their diagnostic tools	Classroom lecture, ICT based learning, Seminar Case based learning, Problem based learning,	CLO3
IV	a) Digestive system: Organs, composition, and functions of digestive juices, process of digestion, organs and process of absorption, Tridosha theory (Vata, Pitta, Kapha) in digestive and metabolic balance b) Disorders of the digestive system and their diagnostic tools c) Excretion: Organs, regulation, composition of urine, diluting and concentrating mechanism of urine by the kidney d) Disorders of the excretory system and their diagnostic tools	Classroom lecture, ICT based learning, Seminar Case based learning, Problem based learning	CLO4

- **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 Assessment

Unit	Aligned CLOs	Total Learning Hours	Approximate weightage (Marks) to Learning levels (BT)			Total Marks
			Remember (R)	Understanding (U)	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**

- **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	1	1	1	2	1
CLO2	3	3	2	1	1	1	1	1	1	1	1	1
CLO3	3	3	2	1	1	1	1	1	1	1	2	1
CLO4	3	3	2	2	1	1	1	1	1	1	2	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	-

M.Sc. (Home Science) Foods and Nutrition Semester-I

- **Suggested Learning Materials Books:**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Essentials of Medical Physiology	K. Sembulingam	8th Edition, 2019	Jaypee Brothers Medical Publishers
2	Guyton and Hall Physiology Review	John E. Hall	3rd Edition, 2016	Elsevier Saunders
3	Human Physiology (Vol. 1 & 2)	C. C. Chatterjee	12th Edition 2018	CBS Publishers & Distributors Pvt. Ltd., India

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1	e-PG Pathshala – Human Physiology modules	https://epgp.inflibnet.ac.in
2	NPTEL – Human Physiology and Biomedical Sciences lectures	https://nptel.ac.in
3	OpenStax – Free Human Physiology textbook and resources	https://openstax.org/details/books/anatomy-and-physiology
4	PubMed – Research articles on physiology and clinical biochemistry	https://pubmed.ncbi.nlm.nih.gov

M.Sc. (Home Science) Foods and Nutrition Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme	Total Notional Hours	Course credits
			L-P-T		
DSC	P2H01NCFDN04	Practical based on Principles & Applications of Instruments & Techniques and Basic Biochemistry	0-8-1	**120**	04

- **Course Learning Outcomes (CLOs)**

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

CLO1. Apply spectroscopic techniques such as spectrophotometry and fluorometry for qualitative and quantitative analysis.

CLO2. Perform and demonstrate chromatographic and electrophoretic techniques for separation of biomolecules, and evaluate food quality using analytical instruments.

CLO3. Determine physicochemical properties of lipids including saponification value, iodine value, peroxide value and acid value. Analyse proteins using biochemical methods such as serum protein estimation and Lowry method.

CLO4. Determine optimum pH and temperature for enzyme activity through experiments and evaluate and interpret biochemical parameters in relation to nutritional status.

Unit	Course Content	Learning Pedagogies	CLO(s)
I	Determination of λ max of a compound; Verification of Beer-Lambert's law; Acid-base titration using pH meter. Use of fluorometer for fluorescent compounds (riboflavin); Spectrophotometric analysis	Laboratory Practicals, Problem-Based Learning	CLO1
II	Separation techniques: Paper chromatography (amino acids), adsorption chromatography (β-carotene), Thin Layer Chromatography (lipids). Electrophoresis (serum proteins); Measurement of color and texture of food; Visit to advanced research laboratory	Laboratory Practicals, Problem-Based Learning	CLO2
III	Qualitative and quantitative analysis of carbohydrates; Estimation of starch, Determination of lipid constants:	Laboratory Practicals,	CLO3

	saponification value, iodine value, peroxide value, acid value, Reichert-Meissl (R.M.) value.	Problem-Based Learning	
IV	Protein analysis: Total serum protein, albumin, globulin, A/G ratio; Estimation of cellular protein by Lowry method, Enzyme kinetics (optimum pH and temperature); Quantitative estimation of cholesterol	Laboratory Practicals, Problem-Based Learning	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	32	1	1	10	12
III	CLO3	28	1	1	10	12
IV	CLO4	30	1	1	11	13
		120	**04**	**04**	**42**	**50**

- **Assessment and Evaluation**

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Food Analysis	Suzanne Nielsen	3rd Edition, 2010	Springer, New York
2	Official Methods of Analysis of AOAC International	Sidney Williams (Editor)	17th Edition, 2000	AOAC International
3	A Manual of Laboratory Techniques	Narasinga Rao Raghuramulu, Kalyanasundaram Nair, Shanta Kalyanasundaram	2nd Edition, 2003	National Institute of Nutrition, Hyderabad

4	Biochemical Methods	S. Sadasivam, A. Manickam	3rd Edition, 2008	New Age International
5	Official Methods of Analysis of AOAC International	William Horwitz (Editor)	18th Edition, 2005	AOAC International
6	A Manual of Laboratory Techniques	Narasinga Rao Raghuramulu, Kalyanasundaram Madhavan Nair, Shanta Kalyanasundaram	2nd Edition, 2003	National Institute of Nutrition, Hyderabad

(C) CLOs – PLOs Matrix

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

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

M.Sc. (Home Science) Foods and Nutrition Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H01NCFDN05	Practical based on Physiology & Clinical Biochemistry and Food Microbiology	0-8-1	**120**	04

- **Course Learning Outcomes (CLOs)**

CLO1. Execute and interpret biochemical tests for blood glucose and lipid profile, and evaluate their significance in diabetes and cardiovascular diseases.

CLO2. Carry out and interpret kidney and liver function tests and blood cell counts, and assess their clinical significance in health and disease

CLO3. Apply and evaluate fundamental microbiological techniques, including staining, aseptic handling, sterilization, microbial isolation, and enumeration methods.

CLO4. Analyze and interpret the microbiological quality of water, milk, and food samples using standard microbiological methods (SPC, MBRT, selective media) to assess contamination and food safety

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	Diagnostic tests for Diabetes (fasting & post-prandial glucose); Lipid profile (cholesterol, triglycerides, HDL, AST)	Laboratory practicals, Case based learning	**CLO1, CLO2**
II	Kidney function tests (urea, uric acid, creatinine – serum & urine); Liver function tests (ALT, ALP, bilirubin); Enumeration of RBC and WBC	Laboratory practicals, Case based learning	**CLO1, CLO2**
III	a) Staining techniques – Gram staining, methylene blue staining, spore staining, capsule staining b) Streaking- simple streaking and four flame streaking	Laboratory practicals	**CLO3, CLO4**

	c) Preparation for enumerating microorganism: Autoclaving, Serial dilution technique, Pour plate and spread plate methods, total viable count (TVC), Calculation of CFU		
IV	a) Bacteriological examination of water, SPC of different sources of water - on nutrient agar, Hichrome agar for E. Coli, etc. b) Bacteriological examination of milk and curd – MBRT test to assess the quality of milk, SPC using nutrient agar, lactobacillus count on MRS agar, yeast and mold count on PDA agar, etc c) Microbial count of different foodstuff – SPC on nutrient agar, yeast and mould count on PDA from different food stuff, e.g. sweet preparations such as ice-creams, street foods such as panipuri, etc	Laboratory practicals, Case based learning, Problem based learning	**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	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**

- **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) CLOs – PLOs Matrix

CLO \ PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	3	3	3	2	-	3	-	-	3	1	-	-
CLO2	3	3	3	2	1	3	-	-	3	1	-	-
CLO3	3	3	3	2	-	2	-	-	3	1	-	-
CLO4	2	3	3	3	1	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	Practical Clinical Biochemistry	Harold Varley	4th Edition, 2005	CBS Publishers
2	A Manual of Laboratory Techniques	Narasinga Rao Raghuramulu, Kalyanasundaram Madhavan Nair, Shanta Kalyanasundaram	2nd Edition, 2003	National Institute of Nutrition, Hyderabad
3	Experimental Microbiology (Vol. I)	Patel Rakesh, J. & Patel Kiran, R.	8th Edition, 2015	Aditya Publication, Ahmedabad.
	Manual of Microbiology, Tools & Techniques.	Sharma, K.	2nd Edition	Ane Books Pvt. Ltd.

M.Sc. (Home Science) Foods and Nutrition Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme L-P-T	Total Notional Hours	Course credits
DSC	P2H01NCFDN06	Food Microbiology	2-0-1	**60**	02

- **Course Learning Outcomes (CLOs)**

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

CLO1. Differentiate and classify microorganisms relevant to food microbiology, and analyze factors influencing microbial growth and survival in food systems.

CLO 2. Evaluate the mechanisms of food spoilage, contamination, and food-borne hazards, and propose appropriate prevention and control measures.

CLO3. Apply and evaluate microbial applications in fermented foods and appropriate culture media and inoculation techniques, and correlate them with traditional Indian fermentation practices.

Unit	Course Content	Learning Pedagogies*	CLO(s)
I	a) Classification of bacteria relevant to food microbiology (eight group classification) b) Microbial growth – growth curve, factors affecting the growth and survival of microorganisms in foods – intrinsic factors for growth such as moisture, pH and acidity, nutrient content, biological structure, redox potential, naturally occurring antimicrobial in foods etc. Extrinsic factors for growth – types of packaging/atmospheres, temperatures and humidity conditions of microbial growth c) Types of culture media with examples and inoculation techniques.	Classroom Lectures, ICT-Enabled Learning, Collaborative Learning, Self-directed learning	CLO1, CLO3
II	a) General principles underlying food spoilage, chemical changes caused by microorganisms – changes in nitrogenous organic compounds, non-nitrogenous organic b) Contamination, food spoilage and prevention in different kinds of foods – cereals, pulses, vegetables, and fruits, milk and milk products, sugar and sugar products, salt, spices and canned foods c) Food Hazards: Food borne infections, food intoxications (poisoning), symptoms, toxicity, foods involved, methods of prevention and control –Bacillus, Campylobacter, Staphylococcus, Clostridium, E. Coli, Vibrio Cholerae, Salmonella, Shigella.	Classroom Lectures, ICT-Enabled Learning, Self-directed learning, Seminar	CLO2 CLO3

	d) Microbes in fermented foods – in alcoholic beverages, in indigenous food products such as idli, khaman, in bread, in milk and milk products – Yogurt, butter, cheese, fermented milks,in soybean based fermented foods - soya sauce, tempeh miso, in other oriental fermented foods – sauerkraut, kimchi, poi, etc.; Probiotic fermented foods e) Traditional Indian fermentation practices (*Sandhana Kalpana*) in Ayurveda f) Role of naturally fermented foods in gut health (Agni) and immunity (Vyadhikshamatva)		

- **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, CLO3	25	2	2	7	11
II	CLO2, CLO3	35	2	2	10	14
		60	**04**	**04**	**17**	**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	CLO11	CLO12
CLO1	3	2	2	1	-	-	1	1	-	-	-	-
CLO2	2	3	3	2	1	1	2	2	1	2	1	–
CLO3	2	2	3	2	1	–	1	2	2	1	2	1

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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	Basic Food Microbiology	Banwart, G.J.	2nd Edition 1989	AVI Publishers
2	(Food Microbiology	Frazier, J; Westhoff, DC.	5th Edition 2017	McGraw Hill Pvt. Ltd..
3	Modern Food Microbiology	Jay, J.M.; Loessner, M.J, Golden D.A.	7th Edition 2005	Springer
4.	Handbook of Indigenous Fermented Foods	Steinkraus, KS	1996	Marcel Dekker

- **Online Resources (Open Source)**

Sr. No.	Description of Resource(s)	Weblink
1.	Food Microbiology	https://epgp.inflibnet.ac.in/
2.	International Journal of Food Microbiology. Elsevier	https://www.sciencedirect.com/journal/international-journal-of-food-microbiology
3.	Indian Journal of Microbiology, Springer	https://link.springer.com/journal/12088
4.	Journal of Applied Microbiology, Wiley Blackwell	https://enviromicro-journals.onlinelibrary.wiley.com/journal/13652672
5.	Probiotics and Antimicrobial Proteins, Springer	https://link.springer.com/journal/12602
6.	Fermented Foods	https://www.sciencedirect.com/journal/fermented-foods

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

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