



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: Under Graduate

Branch: Food Engineering & Technology

Course / Subject Code: BE04051011

Course / Subject Name: Food Biochemistry & Nutrition

w. e. f. Academic Year:	2025-26
Semester:	04
Category of the Course:	Professional Core Courses

Prerequisite:	Basic understanding of biology and chemistry
Rationale:	This course provides foundational knowledge about human nutrition, the role of nutrients, metabolic pathways, and the science behind digestion, absorption, and nutrient utilization. Emphasis is placed on nutrient functions, requirements across life stages, metabolic regulation, effects of food processing, and related biochemistry. The course prepares students for advanced studies and careers in food science, dietetics, and public health by integrating scientific principles with hands-on and analytical approaches to human nutrition.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Describe the classification, functions, and sources of macro and micronutrients.	Remember / Understand
02	Explain the process of digestion, absorption, and metabolism of carbohydrates, proteins, and lipids.	Understand
03	Apply knowledge to assess nutritional requirements and plan balanced diets for different populations.	Apply /
04	Analyze the impact of food processing on nutrient retention and bioavailability.	Analyze
05	Evaluate dietary modifications for deficiency diseases and therapeutic nutrition.	/ Evaluate
06	Interpret the role of enzymes and hormones in metabolic reactions and energy regulation.	Understand / Analyze

Teaching and Examination Scheme:

Teaching-Learning Scheme (in Hours per Semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
L	T	P	PBL*	TH		Theory		Tutorial/Practical			
						ESE (E)	PA (M)	PA/ (I)	PBL (I)	ESE (V)	
45	0	30	45	120	04	70	30	20	30	50	200



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Where L=Lecture, T=Tutorial, P=Practical, TW/SL=Term-Work/Self-Learning, TH=Total Hours, ESE=End-Semester Examination, PA = Progressive Assessment

*Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Food & Nutrition: Introduction to the course, Definitions of nutrient, nutrition, food, Factors affecting human nutrition, Functions of food, Classification of food, Food Groups, Food guide pyramid, Nutrient wheel Definitions, functions, deficiency symptoms and excessive consumption consequences of macronutrients, water, dietary fiber	8	16
2.	Nutritional requirement: RDA for individuals, Principles in planning a balance diet, Balance diets for infants, children, adults, Basal metabolism rate and factors affecting	4	13
3.	Vitamins and Minerals: Introduction, Classification of vitamins, major source, functions and deficiency symptoms, requirement	6	11
4.	Digestion and Absorption of Food in Human System: Digestion and Absorption of protein, carbohydrate, lipids Factor affecting on digestion and absorption,	6	13
5.	Processing Aspects of Nutrients: Effect of heat processing on carbohydrate, protein and fat, Addition of nutrients like fortification, supplementation, enrichment, restoration	5	11
6.	Enzymes: Introduction, Structure & characteristics, Specificities, Catalysis & regulation, Nomenclature & classification, Cofactors, mechanism of enzyme action, Factors affecting enzyme catalysed reactions, Enzyme competitive and uncompetitive inhibition Role and applications of enzymes in food processing	5	11
7.	Metabolism: Glycolysis, TCA cycle, β -oxidation of fatty acids	6	13
8.	Overview of Intermediary Metabolism: The basic metabolic pathway, Carbohydrate metabolism, Lipid metabolism, Amino acid metabolism, Role of hormone in metabolism.	5	12
Total		45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level



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35	35	10	10	10	00
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Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Advanced Text Book on Food and Nutrition Vol. 1 by M. Swaminathan (The Bangalore Printing and Publishing Co. Ltd., Bangalore)
2. Food Nutrition and Dietetics 2nd Edn. by Shubhangini Joshi (Tata McGraw Hill Education Pvt. Ltd., New Delhi)
3. Food Chemistry by L H Meyor (CBS Publisher, Delhi)
4. Human Nutrition and Dietetics – Davidson & Passmore
5. Normal and Therapeutic Nutrition – Corinne H. Robinson & Marilyn Lawler
6. Nutrition: Concepts and Controversies – Eleanor Whitney (8th Ed.)
7. Basic Principles of Nutrition – Seema Yadav
8. Understanding Nutrition – Whitney and Roes
9. Clinical Dietetics and Nutrition – Antia F.P. & Philip Abraham
10. Krause's Food, Nutrition and Diet Therapy – Kathleen Mahan & Sylvia Escott-Stump.

(b) Open-source software and website:

1. USDA FoodData Central (nutrient database), <https://fdc.nal.usda.gov/>
2. OpenFoodFacts (nutrition analysis), <https://world.openfoodfacts.org/>
3. Nutrition analysis tools: wger, Waistline, DietCli (open source; for tracking or lab projects),
4. FSSAI resource portals <https://share.google/WnSDRym5wzms8ItjH>
5. FAO resource portals: <https://www.fao.org/sustainable-development-goals-helpdesk/accelerate/data-portals/en>
6. WHO resource portals: <https://www.who.int/resources>
7. Nutritional calculation websites: Nutritics, Edamam, Samsung Food Recipe Calculator.

Suggested Course Practical List

1. Calculation of calorific value of food products
2. Planning balanced diets for different age groups and lifestyles.
3. Calculation of Recommended Dietary Allowances (RDA) and menu planning.
4. Assessment of obesity by determining Body Mass Index (BMI) and determination of calorific need of an individual



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5. Preparation and nutrient analysis of therapeutic diets.
6. Preparation and nutrient evaluation of weaning and low-cost foods.
7. Preparation of specified pH and ionic concentrations biological buffers and to verify the pH of prepared Buffer using digital pH meter
8. Determination of ascorbic acid content in food samples
9. Study of enzymatic browning reaction and factors affecting on it
10. To study the effect of temperature on the activity of enzyme (α -amylase)
11. Study of food guides (My Plate, food groups, nutritional labels)
12. Nutrient Losses During Cooking
(Read or discuss data on percentage loss of vitamins during boiling and frying. Explain reasons for nutrient losses and suggest methods to minimize them, referencing food chemistry principles.)
13. Food Label Nutritional Assessment
(Examine sample nutrition labels (provided in books or online) and assess if they meet daily nutrient requirements for adults. Discuss missing or excessive nutrients and their potential health impacts.)
14. Mineral Deficiency Case Study
(Present a theoretical case of iron deficiency anemia with sample blood test data. Cue students to recommend dietary modifications and supplementation options.)
15. Laboratory visit for demonstration of protein and fat estimation.

List of Laboratory/Learning Resources Required: Equipment

- Precision balances, weighing scales
- Spectrophotometer, colorimeter, pH meter
- Hot air oven, incubator, centrifuge, autoclave
- Microbiology kits, glassware (beakers, pipettes, burettes)
- Blender, mixer, food processor



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- Refrigerator, BOD incubator, laboratory glassware set
- Sample trays, petri dish, test tubes, culture media.

*List of suggested activities for Problem Based Learning:

Sr. No.	Activity Name	Suggested Topics / Focus Area	Hours	Evaluation Criteria
1	Industry/Research Laboratory Visit	Visit Nutrition/R&D Labs, food testing, clinical nutrition	10 h (Visit +Report)	Report with observations, flowchart, supervision notes
2	Technical Video- Based Learning	Food processing/diet planning/MOHFW videos	10 h	Report, answer sheet, learning points
3	Assignment Writing (Theoretical)	Menu/Diet Sheet development, nutrient conductivity	10 h	Presentation, content accuracy
4	Problem Solving/ Coding	Food labeling calculation, food quality simulation	10 h	Solution development, assessment output
5	Online Course (MOOCs)	NPTEL, Swayam, WHO, FAO modules	10 h	Based on completion and reflective submission
6	Complex Problem Solving	Therapeutic diet planning, clinical case studies	10 h	Assessment of accuracy and creativity
7	Literature Review	Diet therapy reviews, meta-analyses	8 h (+4 papers)	Critical review, report submission
8	Research Paper Discussions	Current trends in nutrition and health	20 h (5 papers×4 h)	Discussion and reflective notes
9	Poster/Chart/Power Point Presentation	Vitamins/Minerals poster, visual aids for dietetics	6 h	Clarity, creativity, external feedback
10	Model Development (Working/Non-working)	DIY calorimeter, food spoilage demonstration	8–12 h	Functionality and usability check



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11	Industrial Exposure (2-3 Days)	Clinical dietetics, food safety lab, quality control	20 h	Critical review, participation certificate
12	Group Discussion (Tech Trends)	AI in Nutrition, Food sustainability, Plant-based diets	1h per GD	Technical input, communication skill rating
13	Case Study/Regulatory Aspect	FSSAI standards, regulatory breaches, contamination cases	10 h	Report with analysis and regulation linkage
14	Application/Software Development	Food loss calculator, menu planning software	10 h	Based on functionality and usability

- All records pertaining to the evaluation and assessment of self-learning activities must be properly maintained and preserved at the institute level. These records should be made available to the university upon request.
- Institutes are encouraged to utilize digital platforms, such as Microsoft Teams, for effective record-keeping and to ensure transparency in the evaluation and assessment of self-learning activities.

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