

**CURRICULUM AND CREDIT FRAMEWORK FOR
FOUR-YEAR UNDERGRADUATE PROGRAMME
WITH SINGLE MAJOR IN NUTRITION**

(w.e.f. A.Y. 2023-2024)



BANKURAUNIVERSITY

BANKURA

WESTBENGAL

PIN722155

Provisional Course Structure w.e.f. A.Y. 2023-2024

Category of course (credit)	Major		Minor	Multi disciplinary (3)	Skill Enhancement Courses (SEC) (3)	Ability Enhancement Courses (AEC) (2)	Value Added Courses common for all (4)	Internship (2)	Research Project / Dissertation* (12)	TOTAL CREDIT / NUMBER OF COURSES
	SEM	DSC								
I	Food Science and Basic Nutrition I S/NUT/101/ MJC-1	--	Food Science and Basic Nutrition I S/NUT/102/ MN-1	Fundamentals of Food and Nutrition S/NUT/103/ /MD-1	Nutritional Enrichment of Common Indian Dishes S/NUT/104/ /SEC-1	As offered by institute ACS/105/ /AEC-1	As offered by institute ACS/106/V AC-1			20/6
II	Food Science and Basic Nutrition II S/NUT/201/ MJC-2		Food Science and Basic Nutrition II S/NUT/202/ MN-2	Food Groups and Cooking Methods S/NUT/203/ /MD-2	Practical Approaches in Food and Nutrition S/NUT/204/ /SEC-2	As offered by institute ACS/205/ /AEC-1	As offered by institute ACS/206/V AC-1			20/6
CERTIFICATE (total credit)	8		8	6	6	4	8	4*(ADDITIONAL) ACS/207/ /INT-1		40
III	Human Nutrition S/NUT/301/ MJC-3 Human Physiology I S/NUT/302/ MJC-4		Human Nutrition S/NUT/303/ MN-3	Nutrition through lifespan S/NUT/304/ /MD-3	Nutritional Management of Malnutrition in Community S/NUT/305/ /SEC-3	As offered by institute ACS/306/ /AEC-3				20/6
IV	Human Physiology II S/NUT/401/ MJC-5 Nutritional Biochemistry I S/NUT/402/ MJC-6 Food Commodities S/NUT/403/ MJC-7 Diet Therapy I S/NUT/404/ MJC-8		Food Commodities S/NUT/405/ MN-4			As offered by institute ACS/406/ /AEC-4				22/6
DIPLOMA (total credit)	32		16	9	9	8	8	4*(ADDITIONAL) ACS/407/ /INT-2		82
V	Diet Therapy II S/NUT/501/ MJC-9 Nutritional Biochemistry II	Food Safety and Sustainable Nutrition OR Food Service Management S/NUT/503/ MJE-1 Maternal and Child Nutrition	Therapeutic nutrition S/NUT/505/ MN-5					As offered by institute ACS/506/ /INT-3		22/6

	S/NUT/502/ MJC-10	OR Basic Principles of Biophysics S/NUT/504/ MJE-2								
VI	Community Nutrition S/NUT/601/ MJC-11	Research Methodology OR Analytical Instrumentation S/NUT/603/ MJE-3	Community Nutrition S/NUT/605/ MN-6							20/5
	Epidemiology S/NUT/602/ MJC-12	Biostatistics for Nutrition Research OR Food Product Development and Marketing S/NUT/604/ MJE-4								
UG DEGREE (total credit)	64		24	9	9	8	8	2		124
VII	Food Microbiology S/NUT/701/ MJC-13	Inborn error of metabolism and Food Allergy OR Food Biotechnology S/NUT/702/ MJE-5	Epidemiology S/NUT/705/ MN-7							20/5
		Community Hygiene and Sanitation OR Nutrition Counselling S/NUT/703/ MJE-6								
		Environment and Sustainability OR Nutrigenomics and Bioinformatics S/NUT/704/ MJE-7								
VIII	Public Health Nutrition S/NUT/801/ MJC-14	Nutrition for Athletes OR Hospital Food service Management S/NUT/802/ MJE-8	Public Health Nutrition S/NUT/805/ MN-8							
		Food Toxicology OR Food Industry Management S/NUT/803/ MJE-9								
		Basics of Computer Application								

		OR Concept of Nutrition Education and Communication S/NUT/804/MJE-10								
UG HONS. (total credit)	96	32	9	9	8	8	2			164
UG HONS. WITH RESEARCH (total credit)	84	32	9	9	8	8	2	12^		

**Semester-wise detailed course curriculum
SEMESTER-I**

Course Code	Course Category	Course Title	Credit	Marks			No. of Hours		
				I.A.	ESE	Total	Lec.	Tu.	Pr.
S/NUT/101/MJC-1	Major	Food Science and Basic Nutrition I	4 (3+1)	10	40 (25+15)	50	4	-	4
S/NUT/102/MN-1	Minor*	Food Science and Basic Nutrition I	4 (3+1)	10	40 (25+15)	50	4	-	4
S/NUT/103/MD-1	Multidisciplinary*	Fundamentals of Food and Nutrition	3	10	40	50	3	-	-
S/NUT/104/SEC-1	Skill Enhancement Course	Nutritional Enrichment of Common Indian Dishes	3	10	40	50	-	-	6
ACS/105/AEC-1	Ability Enhancement Course	Compulsory English: Literature and Communication	2	10	40	50	2	-	-
ACS/106/VAC-1	Value Added Course	Environmental Studies	4	10	40	50	4	-	-
Total in Semester- I			20	40	160	300			

Semester II

Course Code	Course Category	Course Title	Credit	Marks			No. of Hours		
				I.A.	ESE	Total	Lec.	Tu.	Pr.
S/NUT/201/MJC-2	Major	Food Science and Basic Nutrition II	4 (3+1)	10	40 (25+15)	50	4	-	4
S/NUT/202/MN-2	Minor*	Food Science and Basic Nutrition II	4 (3+1)	10	40 (25+15)	50	4	-	4
S/NUT/203/MD-2	Multidisciplinary*	Food Groups and Cooking Methods	3	10	40	50	3	-	-
S/NUT/204/SEC-2	Skill Enhancement Course	Practical Approaches in Food and Nutrition (Practical)	3	10	40	50	-	-	6
ACS/205/AEC-1	Ability Enhancement Course	MIL-I (Santali/Sanskrit/ Bengali)	2	10	40	50	2	-	-
ACS/206/VAC-1	Value Added Course	Health and Wellness/ Understanding India: Indian Philosophical Traditions and Value Systems /Basics of the Constitution of India/Arts and Crafts of Bengal/ Historical Tourism in West Bengal	4	10	40	50	4	-	-
Total in Semester- II			20	40	160	300			

ACS/207/INT-1 (ADDITIONAL) - 4credits to be completed for Certificate Course in Nutrition in 1 year

* To be opted by the students having major course of other discipline.

Detailed Syllabus

Semester I

Course Code: S/NUT/101/MJC-1

Course Category: Major

Course Title: Food Science and Basic Nutrition I

- 1. Historical Perspective of Nutrition:** Brief history of nutrition science, landmarks in the history of nutrition, pioneers of nutrition research in India
- 2. Basic concept of food and nutrition:** Definition and classification of food and nutrients; Meaning of nutrition and balanced diet.
- 3. Carbohydrates:** Definition, Classification, General physical properties of sugars and non-sugars; General chemical properties of carbohydrates –

- Structure and configuration of glucose, fructose and galactose.
- Isomerism: epimers, anomers, D & L sugars, aldoses and ketoses, pyranoses and furanoses with proper examples and configurations.
- Optical activity and mutarotation of glucose.
- Chemical reactions of glucose – oxidation, reduction, acetylation, cyanohydrins formation, oxime formation, osazone reaction (glucose and fructose).
- Chain lengthening of aldoses: Killianisynthesis.
- Chain shortening of aldoses: Ruff degradation.
- Conversion of aldose to isomeric ketose and ketose to isomeric aldose.
- Molecular structure of disaccharides: sucrose, lactose and maltose.
- Reducing and non-reducing sugar.

Dietary sources, functions, role in human health and disease, requirements of carbohydrates.

- 4. Lipids:** Definition, Classification, General physical properties, General chemical properties –
 - General structure of glycerides.
 - Simple and mixed glycerides.
 - Distinction between fats and oils.
 - Hydrolysis, hydrogenation, hydrogenolysis, drying and rancidification of fats & oils.
 - Analysis of fats and oils: Saponification number, Iodine number, Acid number, Reichert-Miessl number, soaps and detergents, Acetyl number.

Dietary sources, functions, role in human health and disease, requirements of fats and lipids.

- 5. Amino acids and Proteins:** Definition, Classification;
 - General properties of amino acids and proteins – Zwitterion, isoelectric point, peptide linkage, colloidal nature, denaturation.
 - General chemical properties of proteins – formation of salts, hydrolysis, oxidation.
 - Colour reaction of proteins – Xanthoproteic test, Biuret test, Milon's test, Ninhydrin test, Hopkins-Cole test.
 - Quality of proteins – BV, NPU, PER, Net Dietary Protein Energy Ratio, Amino Acid Score, PDCAAS.

Dietary sources, functions, role in human health and disease, requirements of proteins.

5. Dietary fibre: Sources, classification and nutritional significance.

Food Science and Basic Nutrition I (Practical)

1. Qualitative detection of carbohydrates: Molisch's test, Benedict's test, Barfoed's test, Seliwanoff's test, Iodine test, Fehling's test.
2. Qualitative detection of fats.
3. Biuret test, xanthoproteic test, ninhydrin test.

Suggested reading:

1. U. Satyanarayan, U. Chakrapani. Biochemistry. ELSEVIER.
2. MN Chatterjea, Rana Shinde. Textbook of Medical Biochemistry. JAYPEE.
3. Antonio Blanco, Gustavo Blanco. Medical Biochemistry. Academic Press.

4. Debajyoti Das. Biochemistry. Academic Publishers.
5. Shivananda Nayak B. Handbook of Biochemistry & Nutrition. JAYPEE.

Course Code: S/NUT/102/MN-1

Course Category: Minor

Course Title: Food Science and Basic Nutrition I

1. **Historical Perspective of Nutrition:** Brief history of nutrition science, landmarks in the history of nutrition, pioneers of nutrition research in India
2. **Basic concept of food and nutrition:** Definition and classification of food and nutrients; Meaning of nutrition and balanced diet.
3. **Carbohydrates:** Definition, Classification, General physical properties of sugars and non-sugars; General chemical properties of carbohydrates –

- Structure and configuration of glucose, fructose and galactose.
- Isomerism: epimers, anomers, D & L sugars, aldoses and ketoses, pyranoses and furanoses with proper examples and configurations.
- Optical activity and mutarotation of glucose.
- Chemical reactions of glucose – oxidation, reduction, acetylation, cyanohydrins formation, oxime formation, osazone reaction (glucose and fructose).
- Chain lengthening of aldoses: Killianisynthesis.
- Chain shortening of aldoses: Ruff degradation.
- Conversion of aldose to isomeric ketose and ketose to isomeric aldose.
- Molecular structure of disaccharides: sucrose, lactose and maltose.
- Reducing and non-reducing sugar.

Dietary sources, functions, role in human health and disease, requirements of carbohydrates.

4. **Lipids:** Definition, Classification, General physical properties, General chemical properties–
 - General structure of glycerides.
 - Simple and mixed glycerides.
 - Distinction between fats and oils.
 - Hydrolysis, hydrogenation, hydrogenolysis, drying and rancidification of fats & oils.
 - Analysis of fats and oils: Saponification number, Iodine number, Acid number, Reichert-Miessl number, soaps and detergents, Acetyl number.

Dietary sources, functions, role in human health and disease, requirements of fats and lipids.

5. **Amino acids and Proteins:** Definition, Classification;
 - General properties of amino acids and proteins – Zwitterion, isoelectric point, peptide linkage, colloidal nature, denaturation.
 - General chemical properties of proteins – formation of salts, hydrolysis, oxidation.
 - Colour reaction of proteins – Xanthoproteic test, Biuret test, Milon's test, Ninhydrin test, Hopkins-Cole test.
 - Quality of proteins – BV, NPU, PER, Net Dietary Protein Energy Ratio, Amino Acid Score, PDCAAS.

Dietary sources, functions, role in human health and disease, requirements of proteins.

6. **Dietary fibre:** Sources, classification and nutritional significance.

Food Science and Basic Nutrition I (Practical)

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4. Debajyoti Das. Biochemistry. Academic Publishers.
5. Shivananda Nayak B. Handbook of Biochemistry & Nutrition. JAYPEE.

Course Code: S/NUT/103/MD-1

Course Category: Multidisciplinary

Course Title: Fundamentals of Food and Nutrition

1. Basic terms used in food and nutrition
2. Functions, dietary sources, clinical manifestations of deficiency/ excess of the following nutrients:
 - Carbohydrates, lipids and proteins
 - Fat soluble vitamins – A, D, E and K
 - Water soluble vitamins – thiamine, riboflavin, pyridoxine, folate, vitamin B₁₂ and vitamin C
 - Minerals – calcium, iron and iodine
3. Food groups and Food pyramid. Concept of balanced diet. Reference man and woman
4. Concept of dietary reference intakes
5. Dietary guidelines for Indians

Suggested reading:

1. B. Srilakshmi. Nutrition Science. New Age International Publishers
2. U. Satyanarayan, U. Chakrapani. Biochemistry. ELSEVIER.
3. Ravinder Chadha. Pulkit Mathur. Nutrition. Orient BlackSwan

Course Code: S/NUT/104/SEC-1

Course Category: Skill Enhancement Course (SEC)

Course Title: Nutritional Enrichment of Common Indian Dishes

1. Weights and measures of common foods - (Raw and Cooked weight)
2. Preparation of various dishes using different methods of cooking
 - Boiling / steaming
 - Roasting
 - Frying-Deep/shallow
 - Pressure cooking
 - Hot air cooking/Baking
3. Preparation of nutrient rich dishes
 - Protein rich dish
 - Carbohydrate rich dish
 - Fat rich dish
 - Vitamins rich dish
 - Fiber rich dish
 - Minerals rich dish

Suggested reading:

1. B. Srilakshmi. Food science. New Age International Publisher
2. N. Shakuntala Manay, M. Shadaksharaswamy. Foods, Facts and Principles. New Age International Publisher
3. Prasanta Mukherjee. Textbook of Food Commodities. Aman Publications

Semester II

Course Code: S/NUT/201/MJC-2

Course Category: Major

Course Title: Food Science and Basic Nutrition II

1. Vitamins: Dietary sources, requirements, physiological and biochemical roles and effects of deficiencies and excesses of

- Fat soluble vitamins
 - Vitamin A
 - Vitamin D
 - Vitamin E
 - Vitamin K
- water-soluble vitamins
 - Thiamine
 - Riboflavin
 - Niacin
 - Pantothenic acid
 - Pyridoxin
 - Folic acid
 - Cobalamin
 - Ascorbic acid
- Anti-vitamin, Provitamin, Pseudovitamin and vitamers.

2. Minerals: Dietary sources, requirements, functions and effects of deficiencies and excesses of calcium, phosphorus, sodium, potassium, iron, iodine, selenium, zinc, fluoride, magnesium, chromium and copper. Absorption of calcium and iron.

3. Water: Requirement, functions, deficiencies and excesses. Water balance and its regulation.

Food Science and Basic Nutrition II (Practical)

1. Colorimetric estimation of carbohydrate (Anthrone method), Protein (Lowry method).
2. Estimation of calcium using EDTA by titration.
3. Estimation of ascorbic acid by using 2, 6-dichlorophenol indophenol method.

Suggested reading:

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2. MN Chatterjea, Rana Shinde. Textbook of Medical Biochemistry. JAYPEE.
3. Antonio Blanco, Gustavo Blanco. Medical Biochemistry. Academic Press.
4. Debajyoti Das. Biochemistry. Academic Publishers.
5. Shivananda Nayak B. Handbook of Biochemistry & Nutrition. JAYPEE.

Course Code: S/NUT/202/MN-2

Course Category: Minor

Course Title: Food Science and Basic Nutrition II

1. Vitamins: Dietary sources, requirements, physiological and biochemical roles and effects of deficiencies and excesses of

- Fat soluble vitamins
 - Vitamin A
 - Vitamin D
 - Vitamin E
 - Vitamin K

- water-soluble vitamins
 - Thiamine
 - Riboflavin
 - Niacin
 - Pantothenic acid
 - Pyridoxin
 - Folic acid
 - Cobalamin
 - Ascorbic acid
- Anti-vitamin, Provitamin, Pseudovitamin and vitamers.

2. Minerals: Dietary sources, requirements, functions and effects of deficiencies and excesses of calcium, phosphorus, sodium, potassium, iron, iodine, selenium, zinc, fluoride, magnesium, chromium and copper. Absorption of calcium and iron.

3. Water: Requirement, functions, deficiencies and excesses. Water balance and its regulation.

Food Science and Basic Nutrition II (Practical)

1. Colorimetric estimation of carbohydrate (Anthrone method), Protein (Lowry method).
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3. Antonio Blanco, Gustavo Blanco. Medical Biochemistry. Academic Press.
4. Debajyoti Das. Biochemistry. Academic Publishers.
5. Shivananda Nayak B. Handbook of Biochemistry & Nutrition. JAYPEE.

Course Code: S/NUT/203/MD-2

Course Category: Multidisciplinary

Course Title: Food Groups and Cooking Methods

1. Nutritional contribution and changes during cooking of the following food groups:
 - Cereals
 - Pulses
 - Fruits and Vegetables
 - Milk and Milk products
 - Eggs
 - Meat, Poultry and Fish
 - Fats and Oils
2. Food Adjuncts: Spices and Herbs; Food Additives
3. Different methods of cooking: Dry heat, Moist heat, Shallow fat frying, Deep fat frying, Braising
4. Effects of cooking on nutritive value of foods

Food Groups and Cooking Methods (Practical)

1. Weight measurement of raw materials
2. Preparation of dishes involving each food group
3. Determination of nutritive value of foods

Suggested reading:

4. B. Srilakshmi. Food science. New Age International Publisher
5. N. Shakuntala Manay, M. Shadaksharaswamy. Foods, Facts and Principles. New Age International Publisher
6. Prasanta Mukherjee. Textbook of Food Commodities. Aman Publications

Course Code: S/NUT/204/SEC-2

Course Category: Skill Enhancement Course (SEC)

Course Title: Practical Approaches in Food and Nutrition (Practical)

- Market survey on consumer behavior of food purchase and awareness regarding nutritional labelling of food products and deciphering nutrition label of packaged food and beverages.
- Identification of adulterants in locally available common food items.

Suggested reading:

1. B. Srilakshmi. Food science. New Age International Publisher
2. Food Safety and Standards Authority of India. Detect Adulteration with Rapid Test.
3. Food Safety and Standards Authority of India. Food Safety and Standards (Labelling And Display) Regulations, 2020

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO	Description
PSO 1	The core courses will help the student to develop knowledge on human physiology, nutritive value of different food, role of food and nutrients on human nutrition, role of nutrition in maintaining health and diseases.
PSO 2	The discipline specific electives will add additional knowledge about applied aspects of the program as well as its applicability in maintaining good health and nutritional status.
PSO 3	The skill enhancement courses would further add additional skills related to the subject.
PSO 4	Students become highly cognizant of the expansion of the learning in their respective field which enables them to get admitted to the premier institutes of the country. An aptitude to research is also stimulated in the minds of this budding generation which prompts them to take up some projects in good laboratories of the country after completing the programme.
PSO 5	Students will be able to analyze and solve the nutrition related problems.
PSO 6	Students will be able to prepare diet chart for normal person as well as for the person in diseased condition
PSO 7	Students will be able to the functions of different nutrients at molecular level, the nutrient gene inter action and modulation of gene expression by nutrients.
PSO 8	The programme will strengthen the students to understand the structure and function of the gene, cell, tissue, organ and organ-system.
PSO 9	Research Motivation is also another significant outcome that the students are endowed with on the completion of the programme.

COURSE OUTCOME

Course Type	Course Title	Course outcome
Semester-I		
Major/Minor	Food Science and Basic Nutrition I	The students will be able to gain basic knowledge on foods, nutrients (carbohydrate, protein and fat) and dietary fibres – there classifications and functions. It will provide knowledge about colorometric estimation of carbohydrate and protein and qualitative detection of carbohydrates.

Multidisciplinary	Fundamentals of Nutrition and Food Science	The students will be able to know about macro and micro nutrients – their sources, functions, consequences of deficiency and excess. It will also help to gain knowledge on foods, food groups and balanced diet.
Skill Enhancement Course	Nutritional Enrichment of Common Indian Dishes	It will provide practical knowledge on different methods of cooking and preparation of dishes involving each food group. It will familiarize students with common methods of Indian cooking and household ways of nutritional enrichment of daily diet.
Semester-II		
Major/Minor	Food Science and Basic Nutrition II	The students will be able to gain basic knowledge on vitamins, minerals and water – their classifications, functions and consequences of deficiency & excess. The practical course will enable the students to know the presence of specific nutrient in a specific food (calcium in milk, ascorbic acid in citrus foods).
Multidisciplinary	Food Groups and Cooking Methods	It will provide knowledge on nutritional contribution of different foods included in food groups. It will also provide knowledge on different methods of cooking. It will provide practical knowledge on different methods of cooking and preparation of dishes involving each food group.
Skill Enhancement Course	Practical Approaches in Food and Nutrition (Practical)	It will provide knowledge on planning meals for adults of different activity levels of different income groups. It will also provide knowledge on assessing self diet (by 24 hours recall method) provide practical knowledge on market survey.