VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN

ELAYAMPALAYAM, TIRUCHENGODE –Tk, NAMAKKAL DISTRICT
(Affiliated to Periyar University, Approved by AICTE, Re-accredited with 'A+' Grade by NAAC)Recognized under section 2(f) & 12 (B) of UGC ACT 1956,

An ISO 9001:2008 Certificate Institution

A U T O N O M O U S

DEPARTMENT OF NUTRITION AND DIETETICS

B.SC. NUTRITION AND DIETETICS

SYLLABUS & REGULATIONS

FOR CANDIDATES ADMITTED FROM 2023-2024 ONWARDS

UNDER AUTONOMOUS & CBCS PATTERN

VIVEKANANDHA EDUCATIONAL INSTITUTIONS

Angammal Educational Trust

Elayampalayam, Tiruchengode (Tk) Namakkal (Dt)

B.Sc., Nutrition and Dietetics

1. SCOPE OF THE COURSE

The course of Nutrition and Dietetics is intended to prepare the students not only to be knowledgeable in the science of Nutrition and Dietetics, but also to be useful in the upliftment of the social and economic well-being. Courses offered cover all areas of basic and applied areas and these prepare students for a Bachelor of Science degree in Nutrition and Dietetics.

The degree is a three-year full-time programme. The programme is not only a specialist programme, but it is also designed to be relevant to the social and economic needs of the nation. In reflection to the specialized nature of the programme, emphasis is given to practical and acquisition of practical skills.

The Programme has been involved in teaching basic and applied Nutrition as well as making findings on local problems of Nutrition and Dietetics interest. The vision of the programme is therefore, to produce graduates who are not only knowledgeable in the science of Nutrition and Dietetics, but who can make significant contributions to the development the human society.

The programme is aimed at training undergraduate graduate students who would have adequate background knowledge and practical skills for application in postgraduate research, teaching, industrial production, medical, hospital and environmental management.

2. SALIENT FEATURES

- Course is specially designed for a higher-level career placement.
- Special guest lecture from industries will be arranged.
- Enables students to gain a job-oriented degree.
- Special industry orientations and training are parts of the degree course.

3. OBJECTIVES OF THE COURSE

The specific objectives of the programme are:

- To equip the undergraduate students with a sound knowledge of the fundamental principles involved in the study of Nutrition and Dietetics.
- To produce graduates who would create an impact in the diverse fields of human endeavor considering the ubiquitous nature of food and the wide – ranging applications of the knowledgeof Nutrition and Dietetics.
- To provide focus for a career in various fields of applied science including Food Industries, Medical Coding, Research Institution, Hospital Administration, Food Service Sectors, Free Lancing, Health Sectors, Quality Control, Biotechnology, Government and Non-Government agencies.

4. ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the first-year degree course for **B.Sc., Nutrition and Dietetics** shall be required to have passed

a) Higher secondary examination with biology as major subjects conducted by the Government of Tamil Nadu.
b) These regulations shall take effect from the academic year 2020-2023 i.e. for the students who are to be admitted to the first year of the course during the academic year 2020-2023 and thereafter.
c) Any examination with biology, chemistry, pure science and home science as major subjects of any other Board accepted asequivalent there to by Periyar University.
d) Vocational stream candidates are also eligible.

5. DURATION OF THE COURSE

- The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The first semester will consist of the period from July to November and the second semester from December to March.
- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women (Autonomous) with the approval of Periyar University.
- Each subject will have six hours of lecture per week apart from practicals for all semesters.

6. CONTINUOUS INTERNAL ASSESSMENT

The performance of the students will be assessed continuously and the Internal Assessment Marks will be as under:

Theory

1. Average of two tests	-	15 Marks
2. Assignment/Library work	-	5 Marks
3. Attendance	-	5 Marks
Total	**25 Marks**	

Practical

1. Average of two tests - 30 Marks

2. Attendance - 5 Marks

3. Record - 5 Marks

Total 40 Marks

Break-up Details for Attendance

Below 75%	- No Marks
76 to 80%	- 1 Mark
81 to 85%	- 2 Marks
86 to 90%	- 3 Marks
91 to 95%	- 4 Marks
96 to 100%	- 5 Marks

PASSING MINIMUM

INTERNAL

The passing minimum shall be 40% out of 25 marks (10 Marks) for internals.

EXTERNAL

In the end semester examinations, the passing minimum shall be 40% out of 75 marks (30 marks)

7. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the end semester examination only on earning 75 % of attendance and only when his/her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

8. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the examination of language, core, allied, elective, skill based elective and non major elective courses and securing marks

a) 75% and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
b) 60% and above but below 75% shall be declared to have passed the examinations in first class without distinction.
c) 50% and above but below 60% shall be declared to have passed the examinations in second class.
d) All the remaining successful candidates shall be declared to have passed the examinations in third class.
e) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for University rank.

9. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than three academic years comprising of six semesters and passed the examinations prescribed and fulfilled such conditions has have been prescribed therefore.

10. PATTERN OF QUESTION PAPER

PART- A (Objective)	Answer all Questions	20 x 1 = 20 Marks
PART- B (500 words)	Answer all 5 Questions (either or type)	5 x 5 = 25 Marks
PART - C (1000 words)	Answer any 3 Questions (three out of five)	3 x 10 = 30 Marks

11. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the University examination in the concerned subject in subsequent semesters and shall pass the examination.

12. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2020 - 2023 i.e. for the students who are to be admitted to the first year of the course during the academic year 2020 -2023 and thereafter.

13. TRANSITORY PROVISION

Candidates who were admitted to the UG course of Nutrition and Dietetics before 2020 – 2023 shall be permitted to appear for the examinations under those regulations for a period of three years *i.e.,* up to and inclusive of the examination of April/May 2023. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

B.Sc., NUTRITION AND DIETETICS

VISION

Empowerment through scientific and value based education for a quality life, exemplary education for robust living and nurturing research pursuit and social commitment

MISSION

Transforming academic inputs to social benefits, nurturing the students for a holistic development, extending community outreach for social up liftment, facilitating academia / clinical / Industrial collaboration.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

1. To furnish the graduates with the ability to prepare to a varying situation by gaining strengthto learn and apply the recent skills with competency.
2. To train the basic and vital knowledge in the field of Nutrition and Dietetics both practicallyand theoretically with the team setup with proper ethical practices.
3. To create the graduates to extend the spirit of empathy, humanity and commitment for Nationdevelopment.

PROGRAMME SPECIFIC OUTCOME (PSO)

B.Sc., NUTRITION AND DIETETICS

1. This program provides comprehensive knowledge and practical training in the human physiology, food science, nutrition & dietetics, biochemistry. **K2**

2. Students will acquire laboratory skills applicable to Nutrition research, Nutrient analysis, Food quality control.

3. Students will lend in achieving sustainable development goals (SDG).

4. They will demonstrate their dietetics skill by analyzing disease condition and prescribed diet for the same.

5. Students will showcase expertise food standardization, formulation and sensory evaluation. **K3**

6. Students gain the knowledge of principles and practices in the main applications of various fields of nutrition and dietetics and to the industrial production of foods, clinical experience in hospitals, other useful products, including the use of modified nutrition and enriched and fortified food products. **K3**

PROGRAMME OUTCOME(PO)

On completion of B.Sc., Nutrition & Dietetics programme, Students should be able to

POS	OUTCOME	CPD
PO-1	Apply knowledge and basic concepts of subjects studied to develop competitive skill metrics (CSM's)	K2
PO-2	Communicate clearly their assorted views and suggestion to the professional community and general public.	K1
PO-3	Supply critical / thinking skills to compete with their counterparts in placing themselves in core companies.	K3
PO-4	Integrate food science, processing, preservation & diet thereby make informed & accurate decision to enhancing quality of life.	K4
PO-5	Design solution for community problems and march towards healthy India.	K5
PO-6	Innovate novel solution for nutritional deficiencies through food product development, enrichment and fortification.	K4
PO-7	Demonstrate interest in climate change and societal nutritional issues.	K5
PO-8	Effective wave of modern technological tools and compile them effectively for knowledge enhancement and updation.	K4
PO-9	Work as a team player in upliftment of the organization.	K2
PO-10	Exhibit ethical values in all paces of professional and personal life.	K3
PO-11	Engage themselves in self-development through which attain sustainability in all walks of his/her life	K6
PO-12	Develop execution skills that meet outs the social, economic and cultural objectives which are relevant to home science related job.	K5

SCHEME OF CURRICULUM – B.Sc., NUTRITION AND DIETETICS
(For the candidates admitted during the academic year 2023– 2024 onwards)

Part	Paper Code	Subject Title	Hours /Week	Credits	University Examination			Exam Hrs.
					Internal	External	Total	
SEMESTER I								
I	23U1LT01	Foundation Tamil - I	6	3	25	75	100	3
II	23U1LE01	English - I	6	3	25	75	100	3
III	23U1NDC01	Food Science	5	5	25	75	100	3
III	23U1NDCP01	Food Science Practical	3	3	40	60	100	3
III	23U1CHGE01	Allied Chemistry - I	4	3	25	75	100	3
III	23U1CHGEP1	Allied Chemistry Practical - I	3	2	40	60	100	3
IV	23U1VE01	Health, Human Values and Yoga	1	2	25	75	100	3
V	23U1ENAC01	Soft Skills for Effective Communication	2	2	25	75	100	3
SEMESTER II								
I	23U2LT02	Foundation Tamil - II	6	3	25	75	100	3
II	23U2LE02	English - II	6	3	25	75	100	3
III	23U2NDC02	Human physiology	5	5	25	75	100	3
III	23U2NDCP02	Human physiology Practical	3	2	40	60	100	3
III	23U2CHGE02	Allied Chemistry - II	4	3	25	75	100	3
III	23U2CHGEP2	Allied Chemistry Practical - II	3	2	40	60	100	3
IV	23U2EVS01	Environmental Studies	1	2	25	75	100	3
V	23U2CSAC02	Office Automation	2	2	25	75	100	2

Part	Paper Code	Subject Title	Hours /Week	Credits	University Examination			Exam Hrs.
					Internal	External	Total	
SEMESTER III								
I	22U3LT03	Tamil - III	6	3	25	75	100	3
II	21U3CE03	Communicative English - III	6	3	25	75	100	3
III	20U3NDC03	Nutritional biochemistry	5	5	25	75	100	3
III	20U3NDCP03	Nutritional biochemistry Practical	3	3	40	60	100	3
III	21U3CSA01	Computer Applications in Nutrition &Dietetics	4	3	25	75	100	3
III	21U3CSAP01	Computer Applications inNutrition & Dietetics Practical	3	2	40	60	100	3
IV	20U3NDS01	SBEC - I - Food Processing	2	2	25	75	100	3
IV	20U3NDN01	NMEC - I - Basic Food Science	2	2	25	75	100	3
SEMESTER IV								
I	22U4LT04	Tamil - IV	6	3	25	75	100	3
II	21U4CE04	Communicative English - IV	6	3	25	75	100	3
III	20U4NDC04	Principles of Human Nutrition	5	5	25	75	100	3
III	23U4NDC05	Food Microbiology	4	5	25	75	100	3
III	23U4NDCP04	Food Microbiology Practicals	3	2	40	60	100	3
IV	20U4NDS02	SBEC - II – Food Preservation	2	2	25	75	100	3
IV	20U4NDN02	NMEC - II - Basic Dietetics	2	2	25	75	100	3

Part	Paper Code	Subject Title	Hours /Week	Credits	University Examination			Exam Hrs.
					Internal	External	Total	
SEMESTER V								
III	20U5NDC05	Nutrition through life cycle	5	5	25	75	100	3
III	20U5NDC06	Dietetics	6	5	25	75	100	3
III	20U5NDC07	Institutional Food Service Management	6	4	25	75	100	3
III	23U5NDC08	Community nutrition	3	5	25	75	100	3
III	20U5NDE01	Performance Nutrition	3	5	25	75	100	3
III	23U5NDCP05	NTLC & Dietetics practical	3	3	40	60	100	3
IV	20U5NDS03	SBEC - III – Bakery & Confectionary	2	2	25	75	100	2
IV	23U5NDSP01	Bakery & Confectionary Practicals(Demonstration)	2	2	-	-	-	-
		Internship	-	1	-	-	-	-
SEMESTER VI								
III	23U6NDC09	Food Microbiology	6	4	25	75	100	3
III	23U6NDCP06	Food Microbiology practical	3	2	40	60	100	3
III	23U6NDC10	Food Safety and Quality Control	5	4	25	75	100	3
IV	20U6NDS04	SBEC - IV – Food product development andmarketing	2	2	25	75	100	3
III	23U6NDE02	Food Packaging and Labelling	2	3	25	75	100	3
III	23U6NDPR01	Project	3	1	40	60	100	3
V	21U6EX01	Extension Activities	-	1	-	-	-	-
		Total		**140**	**1185**	**3015**	**4200**	

LIST OF CORE PAPERS

I. Food Science
II. Human Physiology
III. Nutritional Biochemistry
IV. Principles of Human Nutrition
V. Nutrition in Life Cycle
VI. Dietetics
VII. Institutional Food Service Management
VIII. Community Nutrition
IX. Food Microbiology
X. Food Safety and quality Control

LIST OF PRACTICALS

I. Food Science
II. Human Physiology
III. Nutritional biochemistry
IV. Nutrition in Life Cycle and Dietetics

Students have to choose either SET-I or SET-II for their Elective Courses and Skill Based Elective Courses. Papers from both the sets cannot be mingled. Those students who have selected SET-I for Elective Courses, will have to select SET-I for Skill Based Elective Courses also. Those students, who have selected SET-II for Elective Courses, will have to select SET-II for Skill Based Elective Courses also.

SET- I

LIST OF ELECTIVE COURSES FOR SET-I

I. Performance Nutrition
II. Food Packaging and Labelling

LIST OF SKILL BASED ELECTIVE COURSES (SBEC) FOR SET-I

I. Food Processing
II. Food Preservation
III. Bakery and Confectionery
IV. Bakery and Confectionery (Practical)
V. Food product Development and Marketing

SET-II

LIST OF ELECTIVE COURSES FOR SET- II

I. Nutraceuticals
II. Nutrition for Fitness and Sports
III. Institutional Project

LIST OF SKILL BASED ELECTIVE COURSES (SBEC) FOR SET-II

I. Food Processing
II. Food Chemistry
III. Bakery Science
IV. Food Biotechnology
V. Public Health Nutrition
VI. Food Preservation and Bakery (Practical)

Allied Courses for B.Sc. Nutrition and Dietetics

I Year - Allied Chemistry

II Year - Allied Computer Science

LIST OF NON-MAJOR ELECTIVE COURSES (NMEC) OFFERED BY THE BOARD OF NUTRITION AND DIETETICS/ HOME SCIENCE TO OTHER MAJOR STUDENTS

I. Basic Food Science
II. Basic Dietetics

LIST OF ALLIED COURSES OFFERED BY THE BOARD OF NUTRITION AND DIETETICS/ HOME SCIENCE TO STUDENTS STUDYING DEGREE IN LIFE SCIENCES

SET-I	**SET-II**
Food Science-I	Human Nutrition-I
Food Science-II	Human Nutrition-II
Food Analysis Practical	Clinical Nutrition Practical

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN		
KL	**CPD**	**DESCRIPTION**
K1	Remember	Retrieving, recognizing and recalling knowledge from long-term memory
K2	Understand	Constructing meaning from oral, written and graphic messages through interpreting
K3	Apply	Carrying out or using a procedure through executing or implementing
K4	Analyze	Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing and attributing
K5	Evaluate	Making judgments based on criteria and standards through checking and critiquing
K6	Create	Putting elements to form a coherent or functional hole, reorganizing elements into a new pattern or structure through generating, planning or producing
Note: **KL: K**nowledge **L**evel**; CPD: C**ognitive **P**rocess **D**imension		

SECTION	CPD/GRADE	MARKS	CONTENT	CUMULATIVE
A: 20 X 1	K1 & K2	20	Multiple choice questions	75
B: 1 out of 2 (5 X 5) Either or choice	K2, K3, K5 & K6	25	Short notes	
C: 3 out of 5 X 10	K3, K4, K6	30	Essay type descriptive	

BLOOM'S TAXONOMY BASED INTERNAL ASSESSMENT PATTERN FOR MODEL AND SEMESTER EXAMINATION

BLOOM'S TAXONOMY BASED INTERNAL ASSESSMENT

PATTERN FOR CIA I & II EXAMINATIONS

SECTION	CPD/GRADE	MARKS	CONTENT	CUMULATIVE
A: 10 X 1	K1 & K2	10	Multiple choice questions	25
B: 1 out of 2 (1 X 5)	K2, K3, K5 & K6	5	Short notes	
C: 1 out of 2 (1 X 10)	K3, K4, K6	10	Essay type descriptive	

SEMESTER -I

SEMESTER – I	**CORE - I**
23U1NDC01	
Credits - 5	**05 Hours/ Week**

CORE -1 FOOD SCIENCE

OBJECTIVES:

To enable the students to:

- Understand the classification of food
- Gain knowledge on the composition and nutritive value of foods
- Know the basic methods of cooking and changes observed on cooking foods.
- Obtain knowledge about the nutrients present in the foods.

COURSE OUTCOME:

CO1	Understand the food groups and their functions	**K2**
CO2	Acquire knowledge on different methods of cooking	**K2**
CO3	Apply process of different foods	**K3**
CO4	Use combination of foods in the development of food products.	**K4**
CO5	Identify and control adulterants in various foods and evaluate food quality.	**K5**

UNIT – I

Food groups – Basic 5 food groups. The classification and functions of each food groups. Different methods of cooking food and their advantages and disadvantages. Effect of cooking on the different nutrients. My Plate by NIN.

Cereals: Structure, composition and nutritive value of rice, wheat and millet. Effect of cooking parboiled, raw and aged rice. Principles of starch cookery - Gelatinization and retrogradation. Sugar - Types of sugar, caramelization, factors affecting crystallization, crystalline and non-crystalline candies.

UNIT II

Pulses & Legumes composition, nutritive value, Principles and factors affecting cooking quality of pulses. Soaking, germination and its effects, Anti-nutritional factors (list only general).
Food Additives: leavening agents, shortening, stabilizer, flavoring agent & food substitutes.

UNIT III

Milk & milk products - Composition, nutritive value, kinds of milk, changes in milk on heating; Cream, Butter, Yoghurt, Cheeses and Curd-nutritive value and composition only.

Fats and oils - functions in food, smoking point and factors affecting smoking point of oil, factors affecting absorption of oil on cooking.

Beverages- Classification, nutritive values of Tea, Cocoa, Coffee and malted Beverages. Methods of preparation, serving.

UNIT IV

Vegetables - Classification, composition, nutritive value of vegetables. selection of vegetables, cooking principle and methods of cooking vegetables and their advantages and disadvantages. Pigmentation (general).

Fruits - Classification, composition, nutritive value, changes during ripening of fruits, selection of fruits.

Spices & condiments - Varieties, active components; Medicinal property of spices

UNIT V

Egg - Nutritive value, structure, composition, egg quality, effect of cooking. Selection of eggs.

Meat – Classification, composition of meat, Nutritive value cuts and grades, Rigor mortis, Meat cookery, Tenderization.

Poultry -- Classification, composition, nutritive value. Methods of cooking poultry.

Sea foods - Types of fish, composition, nutritive value, selection of fish, methods of cooking fish.

Nuts as food - Types of nuts and their nutritive value.

Text Books:

1. Srilakshmi. B (2018)., Food Science- 7th Edition, New Age International Publishers, New Delhi.

2. Elizabeth W. Christian and Vickie A. Vaclavik (2014), Essentials of Food Science – 4th Edition, Springer New York Heidelberg Dordrechr Publisher, London.

3. Usha Chandrasekhar, (2002) Food Science and Application in Indian Cookery., Phoenix Publishing house P Ltd, New Delhi.

Reference Books:

1. Brow, A., (2000) Understanding of foods, Thomson Learning Publications, Wadsworth.

2. Mehas, K.Y and Rodgers, S.L., (2000), Food science and you, Mc Millia McGraw CompanyNew York.

3. Parker, R., (2000)., Introduction to food science, Delmer, Thomson Learning Co., Delma.

Web Reference:

1. https://guides.librariespsu.edu/food science
2. https://www.nal.usda.gov/fnic/food-science-and-technology
3. https://foodinfo.ifis.org

SEMESTER – I	**CORE PRACTICAL - I**
23U1NDCP01	
Credits - 3	**03 Hours/ Week**

FOOD SCIENCE PRACTICAL

OBJECTIVES:

To enable the students

- Different types of cereals, pulses, vegetables, fruits and nuts and oil seeds- observation
- Be familiar with various cookery terms, and use of different ingredients & recipes.
- Guidelines to be followed by laboratory.
- Methods of measuring ingredients. Know the preparation of different recipes.

COURSE OUTCOME:

CO1	Demonstrate skills on determination of edible portion, effect of cooking on volume and weight.	**K1**
CO2	Choose appropriate cooking method to conserve nutrients.	**K2**
CO3	Acquire skills on different methods of cooking	**K3**
CO4	Understand experimental cookery	**K2 &K4**
CO5	Develop recipes by applying knowledge on cooking methods and properties of food	**K3**

PRACTICALS:

1. Food Groups:
   Grouping of foods according to Basic V
2. Weights and Volumes of raw and cooked foods:
3. Cereal cookery - 1

a. Cooking quality of aged and new rice - raw and parboiled rice, black rice, brown rice & millets

4. Cereal cookery II

I. Factors affecting preparation of chapattis / Puris made from different kinds of flour

5. Starch cookery:

a. Factors affecting gelatinization of starch

6 Microscopic examination of starch granules- moist vs dry, cooked vs uncooked.

7. Pulse Cookery:

(i) Factors affecting cooking of pulses and legumes- action of acid, pH, heat & alkali

(ii) Effects of soaking and germination of cooking quality by using best methods

8. Fats and oils:

(i) Determination of smoking point of fat

(ii) Factors affecting absorption of fat in the preparation of recipes

9. Vegetable and Fruit cookery:

i) Effects of heat, acid and alkali on fruits and vegetables

ii) Browning reaction and prevention of browning in fat and water-soluble pigments

iii) Preparation of recipes

10. Milk cookery:

(i) Stages of boiling, curdling (using lemon)

(ii) Preparation of recipes

11. Egg cookery:

(i) Coagulation, denaturation of egg

(ii) Different types of boiling eggs

12. Meat cookery:

(i) Effect of different cooking methods on meat fish and poultry

(ii) Preparation using the best method for meat and fish

13. Sugar cookery:

(i) Stages for sugar cookery

(ii) Preparation of sugar product recipes:

REFERENCES:

1. Basic food preparation - A Complcte manual by Department of Foods and Nitntia Lady Invin college, New Delhi, Orient Longman, 1995.
2. The Delights of Vegetarian Cooking, Tarla Dalal, Vakils, Feffer & Simm 1994
3. Encylopedia of Creative cooking Vots 6,16,17 & 18, Bay Books Sydney
4. Hawkins Pressure Cookery and Instructions Book.

SEMESTER –II

SEMESTER – II	**CORE – II**
23U2NDC02	
Credits - 5	**5 Hours/ Week**

HUMAN PHYSIOLOGY

OBJECTIVES

To enables the students to:

- Understand the functioning of the various systems of the human body
- Gain knowledge on the parts of the different physiological systems.

COURSE OBJECTIVES:

CO1	Understand and distinguish the functions of organs in the body.	**K2**
CO2	Comprehension the anatomy of the various organs.	**K1**
CO3	Illustrate the processes of the respective system	**K2**
CO4	Get sensitized about reproductive system and functions	**K2**
CO5	Elaborate the regulation of body fluids and blood parameters.	**K4**

UNIT I

Cell: Structure and Functions of Epithelial, Connective, Muscle and Bone

Tissue: Classification, structure and functions of tissues.

Blood: Composition, functions, coagulation, plasma proteins, formation of RBC, blood groups, blood volume and functions of tissue fluid**.**

Immune System: - Components of immune system

UNIT II

Heart and Circulation: Structure of heart and blood vessels, cardiac cycle, cardiac output, heart rate, ECG-electro cardio graphic leads.

Respiratory System: Structure of respiratory tract, mechanism of respiration – muscles of respiration, gaseous exchange in lungs and tissues, anoxia.

UNIT III

Digestive System - Anatomy of the alimentary canal including liver and pancreas, functions of saliva and gastric juices. Movement of alimentary tract – swallowing, peristaltic movement and movements of intestine, digestion & absorption.

Excretory System: Structure of kidney, nephron; mechanism of formation of urine and Excretory System micturition.

UNIT IV

Nervous Systems - Structure of nervous tissue and neuron. Reflex action, reflex arc and synapse definition only. Structure and functions of cerebrum, cerebellum, medulla oblongata and hypothalamus.

Sensory Organs-- Structure of eye, ear, tongue and nose, physiology of hearing, smell and taste.

UNIT V

Endocrine system - Basic anatomy and functions of pituitary, thyroid, parathyroid, adrenals and Pancreas.

Reproductive system Anatomy of female and male reproductive organs, menstrual cycle.

TEXT REFERENCE:

1. Sembulingam. K and Prema Sembulingam (2019), Essential of Medical Physiology – 8th Edition, Jaypee Brothers Medical Publisher.

2. Chatterjee. C.C., (2004)., Human Physiology Volume I, II , Medical Allied Agency, Kolkata.

REFERENCES:

1. Anil Baran Singha Mahapatra (1998), Medical physiology, 1st edition, Current books International, Calcutta.

2. Mary Brown Merki & Don Merki (1994), Glencoe health-A guide to wellness, 4th edition, McWilliams Hill Company, New York.

3. Best and Taylor (1958), Living Body - A Text Book of Human Physiology, 4th edition, Chapman and Hall publishing, London.

SEMESTER – II	**CORE PRACTICAL - II**
23U2NDCP02	**Total Number of Hours: 35**
Credits - 2	**3 Hours/ Week**

HUMAN PHYSIOLOGY PRACTICALS

OBJECTIVES:

To enable the students:

- To identify structure and functioning of the various systems of the human body
- Gain knowledge on the parts of the different physiological systems and recognize them.

COURSE OUTCOME:

CO1	Have an enhanced knowledge and appreciation of human physiology	**K3**
CO2	Understand the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems	**K2**
CO3	Understand how these separate systems interact to yield integrated physiological responses to challenges such as exercise, fasting and ascent to high altitude	**K2**
CO4	Be able to perform, analyze and report on experiments and observations in physiology	**K4&K5**
CO5	Be able to recognize and identify principal tissue structures.	**K4**

1. Determination of pulse rate
2. Microscopic examination of various tissues and blood vessels
3. Determination of clotting time
4. Determination of bleeding time
5. Recording normal body temperature
6. Determination of blood groups and Rh factor
7. Measurement of height and weight and body mass index
8. Demonstration of RBC and WBC counting
9, Estimation of hemoglobin using haemoglobinometer
10. Test for body flexibility
11. Test for muscle endurance
12. Physical fitness test (Harvard step test)

13. Measurement of blood pressure
14. Packed cell volume- demonstration
15. Visit to a Clinical laboratory.

REFERENCES:

1. Elaine N. Marieb, Pub. Dorling Kindersley, India, Essentials of Human Anatomy & Physiology

2. Anna B. Diankontides & Majori A. Miller, Lutie C. Lenvell , Anatomy & Physiology Work Book & Laboratory Manual, Pub: Mac Miller Publishing House, NY

3. Applied Physiology – S. Wright.

4. Manual of practical physiology-A.K.Jain, Mittal books

5. Stirling William- outline of practical physiology

SEMESTER -III

SEMESTER – III	**CORE – III**
20U3NDC03	
Credits - 5	**5 Hours/ Week**

NUTRITIONAL BIOCHEMISTRY

OBJECTIVES

To enable the students to

- To learn the metabolism of proximate principles
- To know the role of other nutrients in metabolism
- To get a better knowledge on energy capture during metabolic processes

COURSE OBJECTIVES:

CO1	To ensure students to understand and gain theory and practical knowledge.	**K2**
CO2	Different food groups and their nutritive value, biological cycles involved in metabolism.	**K2**
CO3	Importance of biochemistry in cell like role enzyme hormones and water balance.	**K4**
CO4	Life regulation based on micro and macro elements,	**K2**
CO5	Role of vitamins in our daily diet	**K2**

UNIT I

a. Carbohydrates: Classification (Self study) –Monosaccharide- nomenclatures, structures, chemical properties; Disaccharides – structure and properties; Polysaccharides - Starch, glycogen - structure and properties, TCA cycle.

b. Metabolism of Carbohydrates: Glycolysis; glycogenesis, glycogenolysis, gluconeogenesis and HMP shunt.

c. Interrelationship between fat, carbohydrates and protein metabolism,

UNIT II

a. Lipids: Composition, properties (SS) classification of lipids. Phospholipids – structure of lecithin and cephalin only, triglycerides, lipoprotein (classification only).

b. Fat Metabolism: Oxidation of saturated and unsaturated fatty acid. Biosynthesis and catabolism of cholesterol.

c. Respiratory chain: biological oxidation and oxidative phosphorylation.

UNIT III

a. Protein: Classification based on composition and solubility. Amino acid classification based on R group reactions. Physical and chemical properties of amino acids (not for individual amino acids). Protein's structure. Denaturation of proteins

b. Protein Metabolism: Determination, transamination and decarboxylation, Urea cycle, transportation of ammonia, fate of delaminated amino acids (carbon skeleton- outline only).

c. Protein biosynthesis - Diagrammatic scheme and summary only.

UNIT IV

a. Nucleotides and nucleosides - Purine and pyrimidine bases - structure. Structure of

nucleotides.

b. Nucleic Acids: DNA – structure, properties and functions. RNA - structure, types and

Functions.

c. Heamoglobin -- synthesis and catabolism.

UNIT V

a. Enzymes - Definition, classification, action, factors influencing rate of enzyme action.

Michaelis-menton equation and Line weaver-Burke plot.

b. Co-Enzymes: Co-enzymic role of B vitamins in the metabolism of carbohydrates,

proteins and fat.

c. Detoxification Reactions (examples only) – oxidation, reduction, hydrolysis and conjugation.

TEXT BOOK

1. Satyanarayana, U .Chakrapani (2008) - Fundamentals of Biochemistry, Books & Allied publishers, Calcutta

2. Alistair F.Smith, Geoffrey J.Beckkett, Simon W.Walker, Peter W.H.Rae (2005), Clinical Biochemistry, 6th edition, Replika Press pvt Ltd, India.

3. AmbigaShanınugam, (2012)., Fundamentals of Biochemistry for Medical Students, 4th edition, Wolters Kluwer (India), New Delhi.

REFERENCES

1. Harold A Harper, Victor W Rodwell and Peter A Mayes (1939) - Review of Physiological Chemistry, Large Medical Publications, California.

2. Swaminathan M (1981) - Biochemistry for Medical Students, Geetha book house, Mysore

3. Deb, A.C. 1999, Fundamentals of Biochemistry, New Central Book Agency (P) Ltd., Calcutta.

WEB REFERENCE:

1. www.anme.com.mx/libro/principlesofnutrition.pdf
2. https://2012books.lardbucket.org/pdfs/an-introduction-to-nutritional.pdf
3. Krishikosh.egranth.ac.in

SEMESTER – III	**CORE PRACTICAL - III**
20U3NDCP03	
Credits: 3	**3 hours / week**

NUTRITIONAL BIOCHEMISTRY PRACTICAL

OBJECTIVES:

To enable the students to

- Get training on analysis of blood for various parameters
- Understand the reactions of carbohydrates
- Estimation and analysis of urine for various parameter

COURSE OBJECTIVES:

CO1	To ensure students to understand and gain theory and practical knowledge.	**K2**
CO2	To provide practical laboratory training in the estimation of various nutritional parameters in blood and urine.	**K3**
CO3	To acquires skills in using laboratory instruments.	**K1**
CO4	To contrast the values of estimation with normal condition	**K5**
CO5	To apply the principles to estimate various parameters in blood and urine	**K3**

PRACTICALS

1. Estimation of urinary creatinine
2. Estimation of urea- diacetyl monoxime method.
3. Estimation of serum protein Biuret method.
4. Estimation of iron and heaemoglobin
5. Qualitative analysis of sugar- Glucose, Fructose, Galactose, Maltose, Lactose & Sucrose,
   (i) Analysis of unknown sugar - I
6. Quantitative Estimation of Calcium
7. Quantitative Estimation of Iron
8. Quantitative Estimation of Ascorbic acid

REFERENCE:

1. Voet and prat (2004)., Fundamental of Biochemistry, 8th edition, John Wiley& sons
2. Conn, stumpt, (2001), Outline of Biochemistry, 5th edition, John Wiley & sons
3. CHAD cox, (2005), Nutritional Biochemistry, Taylor and francis group, Canada.

SEMESTER – III	**SBEC -1**
20U3NDS01	
Credits - 2	**2 Hours/ Week**

SKILL BASED ELECTIVE- FOOD PROCESSING

OBJECTIVES:

To enable the students to

- Learn about the technology of cereal and pulse processing
- Know the byproducts of cereals, technology of oil extraction, fish and algae cultivation processing

COURSE OUTCOME:

CO1	Learn the recent concepts of food processing	**K1**
CO2	Relate the theoretical knowledge of processing technique with food products development	**K1**
CO3	Choose appropriate foods processing	**K3**
CO4	Understand the relevance of processing for various food commodities	**K2**
CO5	To understand the process of fortification and enrichment of food products	**K2**

UNIT I

Processing of Rice: Milling of Rice-Parboiled rice, raw rice, by-products of rice milling and their utilization. Manufacture of certain breakfast cereals - puffed rice, rice flakes. macaroni, noodles and pasta, instant rice. **Processing of Millets**: Corn, Ragi, Sorghum

UNIT II

Processing of Wheat: Milling - Cleaning, Methods of conditioning milling by-products of wheat milling.

Fortification and Enrichment: Cereals, baked products, confectioneries

UNIT III

Processing of Legumes: Methods of dhal milling- traditional method, improved method of pulse processing

Processing of Nuts and Oil seeds: Methods of oil extraction- Mechanical press, solvent extraction, refining and hydrogenation

Processing of Oil Seeds as Protein concentrates and Isolates: Processing of soybean, sunflower, and peanut. **Fortification and Enrichment**: Fats and oils

UNIT IV

Processing of Sea foods: Fish processing - fish oil, fish protein concentrate, fish meal. Algae as food - Common types of algae used as protein source, cultivation, harvesting, processing, and drying storage and nutritional significance. Mushroom - types of edible mushroom, cultivation, harvesting and processing.

UNIT V

Sugar Processing - Extraction and clinging process.

Cocoa Processing - Composition of cocoa, processing of cocoa milk and plain chocolate. **Coffee Processing** - chemical constituents of coffee, processing - dry and wet process, roastingand grinding, instant coffee and de-caffeinated coffee.

Tea Processing – Different types of tea processing, types chemical constituents of tea, fermentation, drying, roasting and grinding, instant tea and herbal tea.

TEXT BOOKS:

1. Sivasankar, B. (2013) Food Processing and preservation 2nd edition, prentice Hall, Pvt, Ltd.

2. Srilakshmi, N., Food Science, New Age International Private Ltd., New Delhi, 2002.

3. Swaminathan, M., Food Science, Chemistry and Experimental Foods, Bappco Publishers, Bangalore, 2004.

4. Chandrasekhar, U, Food Science and Applications in Indian Cookery, Phoenix Publishing House Private Ltd., New Delhi, 2002.

REFERENCE BOOKS

1. Adams, M.R. and Moss, M.O., Food Microbiology, New Age International (P) Ltd., New Delhi, 2005.

2. Fellow, P., Food Processing Technology – Principles and Practices, 2nd Edition, CRC Press Woodland Publishers, England, 2000.

3. Sommers, C.H. and Xveteng Fan, Food Irradiation Research and Technology, Blackwell Publishing, 2006

WEB REFERENCES:

1. **www.uoguelbhca.in**
2. **https://ifst.onlinelibrarywily.com**
3. **www.sanfoundary.com**

SEMESTER – IV

SEMESTER – IV	**CORE - IV**
20U4NDC04	
Credits - 5	**5 Hours/ Week**

PRINCIPLES OF HUMAN NUTRITION

OBJECTIVES:

To enable the students to,

- Understand the nutritional demands in various stages of life cycle.
- Acquires skills in planning adequate meals in different stages of life cycle.
- To determine physiological changes at different stage of life span.

COURSE OBJECTIVES:

CO1	To define the nutritional needs of each age groups.	**K1**
CO2	To understand the importance of nutrition and health.	**K2**
CO3	To co-relate the physiological and psychological changes adhering to all the age groups.	**K4**
CO4	To interpret the nutritional problems pertaining to different age groups.	**K4**
CO5	To infer the appropriate theories to distinguish the development milestones	**K4**

UNIT-I

Science of Nutrition, Concept of Nutrition- Definition of nutrition, health, nutritional status and malnutrition. RDA- Definition, factors affecting RDA and methods used for deriving RDA.

Carbohydrates- Definition,composition, functions, maintenance of blood sugar levels, requirement, sources, digestion and absorption; Dietary fiber- Definition, classification, physiological effects and sources.

UNIT-II

Proteins- Definition, composition, nutritional classification of proteins and amino acids, functions, sources, requirements, digestion and absorption. Evaluation of protein quality: PER, BV, NPU and Chemical score. Lipids- Definition, composition, functions, sources, requirements,digestion and absorption. Essential fatty acids – Definition, functions, sources and effects of deficiency.

UNIT- III

Energy- Definition, units of measurement, direct and indirect calorimetry; Determination of energy value of food, Total Energy requirement, Factors affecting physical activity, Factors affecting Basal Metabolic Rate, factors affecting Thermic effect of food, Recommended Dietary Allowances and Sources

UNIT- IV

Macro Minerals- Calcium and Phosphorous: Functions, requirements, sources and effects of deficiency.

Micro minerals- Iron, Iodine, Copper, Fluorine and Zinc: Functions, sources, requirements and effects of deficiency. Sodium and Potassium: Functions, sources, requirements and effects of imbalances.

UNIT- V

Fat soluble Vitamins – Vitamin A, D, E and K: Functions, requirements, sources and effects of deficiency.

Water Soluble Vitamins – Thiamine, riboflavin, niacin, ascorbic acid, folic acid, vitamin B6 and vitamin B12: Functions, requirements, sources and effects of deficiency.

References

1 Sumathi R. Mudambi, Rajagopal, M.V., Fundamentals of Foods and Nutrition, New Age International (P)Ltd, Publishers, Third edition, 1997.

2. Srilakshmi B. Nutrition Science, New Age International (P) Ltd, Publishers, Fifth multi colour

edition,2016.

3. Mangala Kango, Normal Nutrition, Curing diseases through diet, CBS Publications, First edition, 2005.

4. Paul.S.,Text Book of Bio-Nutrition, Fundamental and Management, RBSA Publishers, 2003.

5. Sue Rodwell Williams, Nutrition and Diet Therapy, C.V. Melskey Co., 6 th edition, 2000.

6. Mahtab. S.Bamji, Kamala Krishnaswamy and G.N.V Brahmam, Text Book of Human Nutrition, Oxford and IBH Publishing Company, Third Edition.2009.

SEMESTER – IV **23U4NDC05** **Credits - 5**	**CORE PAPER - V** **4 Hours/ Week**

FOOD MICROBIOLOGY

OBJECTIVES:

To enable the students to

1. Learn about morphology and life cycle of different microorganisms
2. To know the food spoilage caused by various microorganisms
3. To know about the various types of poisoning and infections caused by microorganisms and to Study the preventive measures

COURSE OBJECTIVES:

CO1	Acquire the knowledge on the basic concepts of microbes in the food and human welfare.	**K2**
CO2	Relate the theoretical knowledge with microbes in environment	**K4**
CO3	Comprehend the knowledge gained on the characteristics of the microorganisms in food	**K2**
CO4	Understand the relevance of microbial spoilage of various foods and its intoxications	**K2**
CO5	Provide frame work on the concepts of quality control activities	**K7**

UNIT – I

Classification of microorganisms, differences between eukaryotic and prokaryotic.
General characteristics of Bacteria, Virus, Fungi, Protozoa and Algae.

UNIT II

Bacteria and Virus - occurrence, morphology, Reproduction**.**

Mold - morphology, classification, reproduction, physiology and nutrition, genera of molds important in foods

Yeast - morphology, classification, physiology and nutrition, process of hybridization and importance of yeast in foods
Algae - occurrence, morphology, classification, Reproduction and economic importance of Algae.

UNIT- III

Definition and types - Water activity and food spoilage

Food spoilage – Contamination of cereals and cereal products, Contamination of vegetables and fruits, Contamination of egg, Contamination of milk and milk products.

Contamination of meat and meat products, Contamination of fish, Contamination of poultry, contamination of sugar and sugar products.
Canned foods – Definition, objectives and Contamination of Canned foods.

UNIT- IV

Fermentation – Definition, types, microorganisms used in food fermentations

Fermented foods – Types, methods of manufacture for vinegar, saukraut, temph, beer and wine.

Food borne infection and Intoxification – Definition and Types.

Food poisoning by fungal toxins - Aspergillus, Pencillium, Fusarium

UNIT – V

Definition, symptoms and prevention - Staphylococcus, clostridium, Salmonella, Shigella and Campylobacter foods involved, incubation period.

Sewage - composition of sewage, typical organism in sewage (only). BOD definition and determination.

Fundamentals of control of microorganisms in food – extrinsic and intrinsic factors growth **Sterilization and disinfection** – Definition and methods.

TEXT BOOKS:

1. M.R adams., M.O.Moss.,(2018).,Food Microbiology., New age international private limited
2. Bibek ray., ArunBhunia.,(2019)., Fundamentals of food microbiology(fourth edition)Taylor and francis Ltd
3. William C Frazier.,(2017)., Dennis C Westhoff., Foof Microbiology(fifth edition) McGraw Hill Education

REFERENCE BOOKS:

1. MR Adams, MO Moss, (1996), Food Microbiology, New Age International(P) Limited.
2. Micheal P. Doyle & Larry R. Beuchot, 3rd Edition, ASM Press, 2007.
3. Burton J. Bogitsh. Thomas C. Cheng, Human Parasitology, 2nd Edition, Academic Press.

WEB REFERENCES:

1. https://www.frontiersin.org
2. https://www.mdpi.com
3. https://onlinecourses,swayam2.ac.in

SEMESTER – IV	**ALLIED PRACTICAL IV**
23U4NDCP04	
Credits - 3	**3 Hours/ Week**

FOOD MICROBIOLOGY PRACTICAL

OBJECTIVES:

To enable the students to

1. To understand the key concepts in food microbiology

2. To gain knowledge on various methods of microbial analysis of food and dairy product

COURSE OBJECTIVES:

CO1	To understand the significance and activities of microorganisms in food	**K2**
CO2	To understand and describe the characteristics of important pathogens and spoilage microorganisms in food and dairy	**K2**
CO3	To recognize and describe the characteristics of important pathogens and spoilage microorganisms in food	**K4**
CO4	To gain knowledge on various methods of microbial analysis of food and dairy products	**K4**
CO5	To learn various methods for their isolation, detection and identification of microorganisms in food.	**K5**

PRACTICALS

1. Straining method (Gram's staining, spore staining, negative and flagella staining)
2. Isolation and identification of yeast and molds in bread (LCP/KOH, Germ tube method)
3. Milk qualitative test (MBRT/ Resazurin)
4. Isolation and identification of culture characterization of food spoilage bacteria.

REFERENCE:

1. Dr. R.C. Dubey and Dr.Maheshwari (2010)., Practical Microbiology., Chand. S publisher.

Osman Erkemen and T. FarukBozoglu (2016), Food Microbiology, 1st edition,

SEMESTER – IV	**SBEC- II**
20U4NDS02	
Credits - 2	**02 Hours/ Week**

SKILL BASED ELECTIVE- FOOD PRESERVATION

OBJECTIVES

To enable the students to

- Know the principles of preservation
- Understand the various methods of preserving foods.
- Get an idea about the various processed foods available in the market.

COURSE OUTCOME:

CO1	Understand the role microorganisms in food spoilage	**K2**
CO2	Learn the concept of preservation	**K4**
CO3	Understand the ambient temperature processing	**K2**
CO4	Classify the various types of food spoilage	**K4**
CO5	Apply the knowledge to develop new products with minimal processing for better of essential nutrients	**K3**

UNIT -I

Preservation by use of high temperatures

General principles & methods of food preservation - Jam, jelly, marmalade, preserves, squash, RTS.

Canning process – Processing and Spoilage of canned foods.

Bottling process -Principles of preparation of Tomato sauce & pickle. Sauerkraut and mango pickle.

Innovative heat processes.

UNIT -II

Preservation by use of low temperature

Refrigeration - Principles and methods, preparation of food for cold storage and cold storage defects.

Freezing -- Principles, Air blast, immersion freezing;

Freeze- dehydration and dehydro- freezing. Defects in frozen foods, Refrigeration and freezing of egg, meat, fish and poultry

UNIT -III

Preservation by drying and dehydration

Principles and methods: sun, solar mechanical. (cabinet, drum, spray and vacuum). Dehydration of egg and whole milk powder.

UNIT - IV

Preservation with chemicals and radiation

Preservatives: Benzoate, sorbates and acetates, SO2, antibiotics, mold inhibitors and antioxidants and permissible level, Sources of radiation, units of radiation, dosimetry, mode of action of irradiation, Preservation of semi moist/intermediate foods- Principles, and preparation.

UNIT -V

Preservation with fermentation

Manufacture of fermented beverages -wine, beer Manufacture of cheese and yoghurt.
Cereal based fermentation, milk based fermentation.

TEXT BOOKS:

1. Fellow, P., (2009) Food Processing Technology – Principles and Practices, 3rd Edition, CRC Press Woodland Publishers, England.
2. Dhir singh and Dheer singh (2021), Food processing and preservation, Sri Publisher, New Delhi.

REFERENCE:

1. Adams, M.R. and Moss, M.O., (2005), Food Microbiology, New Age International (P) Ltd., New Delhi.

2. Sommers, C.H. and Xveteng Fan, (2006), Food Irradiation Research and Technology, Blackwell Publishing.

3. Subalakshmi. G and Shobha Udibi, (2006), Technology of Food Processing and Preservation, New age international publisher., New delhi.

WEB REFERENCE:

1. www.lic.gov
2. www.cond.org.gr
3. https://nchfp.uga.edu

SEMESTER – IV	**NMEC- II**
20U4NDN02	
Credits - 2	**02 Hours/ Week**

BASIC DIETETICS

OBJECTIVES:

The students will be able to

- Understand the principles of nutrition
- Learn about the nutrients and deficiency

COURSE OUTCOME:

CO1	Learn the concept of Nutrition	**K2**
CO2	Understand the role of macronutrients.	**K2**
CO3	Learn the basic metabolism of macronutrients	**K2**
CO4	To relate metabolism of macro nutrients with health	**K4**
CO5	Gain basic knowledge of the different nutrients and their role in maintaining health of the community.	**K4**

UNIT – I

Carbohydrate – Classification, functions and sources. Importance and sources of fiber.

Energy: Definition, Units for measuring energy, Energy value of foods and RDA.

UNIT – II

Lipids – Composition, classification, functions and sources. Role of lipids causing heart diseases.

UNIT – III

Protein - Composition, classification (nutritional and biological), functions, sources and RDA.

No. of Hours: 06

MINERALS

Calcium, Phosphorus, Iron, Zinc and Iodine– Functions, sources, requirement and effect of deficiency.

UNIT – V

VITAMINS

Vitamin A, D, E, K, B1, B2 & Vitamin C - Functions, sources, requirement and effect of deficiency.

TEXT BOOK:

1. B. Srilakshmi, (2014), Nutrition Science, New Age International (P) Ltd, New Delhi.

REFERENCE:

1. Mangala Kango, (2003) Normal Nutrition (Fundamental & Management) RBSA Publishers S.M.S Highway Jaipur – 302003 L, 2003.

2. M. Raheena Begum, (2005) Text book of Foods, Nutrition and Dietetics, Second Revised Edition, Sterling Publishers Private Ltd, New Delhi.

WEB REFERENCE:

1. www.nutrition.gov
2. www.nab.edu
3. www.who.int

SEMESTER V

SEMESTER – V	**CORE - V**
20U5NDC05	
Credits - 5	**5 Hours/ Week**

NUTRITION THROUGH LIFE CYCLE

OBJECTIVES:

To enable the students to,

- Understand the nutritional demands in various stages of life cycle.
- Acquires skills in planning adequate meals in different stages of life cycle.
- To determine physiological changes at different stage of life span.

COURSE OBJECTIVES:

CO1	To define the nutritional needs of each age groups.	**K1**
CO2	To understand the importance of nutrition and health.	**K2**
CO3	To co-relate the physiological and psychological changes adhering to all the age groups.	**K4**
CO4	To interpret the nutritional problems pertaining to different age groups.	**K4**
CO5	To infer the appropriate theories to distinguish the development milestones	**K4**

UNIT-1

BASICS OF MEALS PLANNING

Definition, principles involved in meals planning and factors affecting meals planning. Recommended allowances RDA for Indians based on Age, Gender and Physical activity. Purpose of Meal Planning, My Plate by NIN.

UNIT-2

PREGNANCY AND LACTATION

Nutrition during Pregnancy - Weight gain, physiological changes, nutritional requirements, complications and nutritional problems in pregnancy- Anemia, Eclampsia-Preeclampsia, Gestational Diabetes Mellitus, Neural tube defects.

Nutrition during Lactation - Physiology of lactation, hormonal control, milk Production, Milk output and factors affecting it- psychological, physical and dietary. Nutritional components of Breast milk. Nutritional requirement of lactating women.

UNIT -3

INFANCY

Nutrition During Infancy-Growth and development- chart by WHO, factors influencing growth, Benefits of breast-feeding, breast-feeding vs bottle feeding, factor to be considered in bottle feeding. Weaning foods – Weaning foods-Supplementary and commercial baby foods. Nutritional requirements of infants, problems in feeding normal and premature infants.

UNIT-4

PRESCHOOL AND SCHOOL GOING CHILDREN

Nutritional needs of pre-school children – Nutritional and food requirements of preschool children. Factors to be considered while planning meals for pre-school children. Eating problems of children and their management, preparation of supplementary foods using available low-cost foods.

Nutrition for School children: Nutritional requirements, meals planning for school children, Nutritional Problems and their Management- childhood obesity, and dental caries, packed lunch.

UNIT – 5

ADOLESCENCE, ADULTHOOD AND GERIATRIC NUTRITION

Nutrition during Adolescence-Physical growth and nutritional requirements, Nutritional problems in adolescence- Iron deficiency anaemia, obesity, anorexia nervosa, bulimia nervosa and Binge eating disorders.

Nutritional needs of adults (men and women) - Nutrition and work efficiency, nutritional requirements of the adults in relation to occupation.

Nutrition during old age - Physiological changes in ageing, Nutritional Requirements, Nutritional Problems of the aged and their management.

TEXT BOOKS:

1. Srilakshimi. B., Nutritional Science, 7th Edition, New Age International Pvt, L., 2010.

2. Srilakshimi. B., Dietetics, 6th Edition, New Age International Pvt, L., 2010.

REFERENCE BOOKS:

1. 1. Kathleen Mahan & Raymond Janice, Food and the Nutrition Care Process, 14th edition, Elsevier, 2017.
2. Sarah arabrahm.,Nutrition through life cycle.,new age International(P) Ltd publishers-2016
3. Sari Edelstein.,Life cycle Nutrition an evidence based approach., Jones and Barlett publisher-2021

WEB REFERENCE:

www.nin.res.in

https://www.who.int

www.icmr.gov.in

www.fao.org

SEMESTER – V	**CORE PRACTICAL - V**
23U5NDCP05	
Credits - 3	**3 Hours/ Week**

NUTRITION THROUGH LIFE CYCLE AND DIETETICS PRACTICALS

OBJECTIVES:

To enable the students to

- To know the dietary pattern to promote optimum health and their nutritional needs.
- To understand the techniques of estimating micro nutrients.

COURSE OBJECTIVES:

CO1	To know the importance of nutrition during life span and also to enlighten on the RDA and dietary notification for different age groups.	**K2**
CO2	Understanding of the conditions where nutrition play a significantrole in disease management	**K2**
CO3	To develop aptitude to learn the stages of growth and development of different age groups	**K4**
CO4	To develop the knowledge to provide nutrition and dietetics carefor individuals, groups and population.	**K4**
CO5	Plan diet for all age groups.	**K6**

PRACTICALS:

1. Meal planning
2. Planning a day's diet for and adult man and women (sedentary/ moderate/heavy worker)
3. Planning a day's diet for pregnancy women.
4. Preparing low-cost weaning foods for Infants.
5. Planning and preparing of a day's diet for a school going child with special emphasis on packed lunches.

6. Planning and preparation of a day's diet for an adolescent- Early, middle and Late adolescents

7. Planning and preparing a geriatric diet

8. Planning and Preparation of Therapeutic diets — soft diet, clear and full liquid diet.

9. Planning and Preparation of diet for obesity and underweight, diarrhea, constipation.

10. Planning and Preparation of diet for fevers of short (Typhoid) and long duration (Tuberculosis)

11. Planning and Preparation of diet for Diabetes and Cardio vascular diseases- Hypertensionand Atherosclerosis

12. Planning and Preparation of diet for

- Peptic ulcer, Jaundice, Cirrhosis, Nephritis.
- Cancer patients

REFERENCES

1. Vimala V., (2010), "Advance in Diet therapy- Practical Manual., New Age International Publisher.
2. Dietary Guidelines of Indians- A Manual., (2015)., National Institution of Nutrition, Hyderabad
3. Sarah arabrahm., (2016), Nutrition through life cycle., New Age International(P) Ltd publishers
4. Sari Edelstein., (2021), Life cycle Nutrition an evidence-based approach., Jones and Barlett publisher

SEMESTER- V	**CORE -VI**
20U5NDC06	
Credits- 5	**Hours/Week: 5**

DIETETICS

OBJECTIVES

To enable students

1. To describe the roles and responsibilities of a dietitian in a hospital.
2. To plan and prepare therapeutic diets for patients.
3. To organize diet counseling to patients and family.

COURSE OUTCOME:

CO LEVEL	COURSE OUTCOME	KNOWLEDGE LEVEL
CO1	Comprehend the feeding techniques.	**K1**
CO2	Know the corrective measure in malnutrition.	**K2**
CO3	Acquire skills and techniques in the planning and preparation of therapeutic diets for febrile condition and gastrointestinal disorders	**K3**
CO4	Develop skills and techniques in the planning and preparation of therapeutic diets for disease conditions.	**K3**
CO5	Develop skills and techniques in the planning and preparation of therapeutic diets for Liver and Urinary tract disease.	**K3**

UNIT- I

- Definition of Dietetics - Purpose and principles of therapeutic diets. Factors considered in planning therapeutic diets. Classification and Roles of dietitians. Organization and job description of dietitians, Indian Dietetics Association, Registered Dietitian.
- Routine Hospital diets - Clear fluid diet, full fluid diet - soft diet, regular normal diet - pre-operative diet, post-operative diet.
- Special feeding methods - Tube feeding, Parental feeding - advantages and disadvantages.

UNIT - II

Causes, symptoms and dietary management of

- Febrile diseases -Typhoid, Influenza, Malaria, fever, Dengue, Tuberculosis, HIV, Covid-19, SAARS infection.
- Diet in Allergy - Definition, Classification, Food allergens, test for allergy dietary¬ treatment. Dietary recommendations for Lactose intolerance, Celiac disease, Gluten intolerance.

UNIT - III

Causes, symptoms and dietary management of

- Gastro intestinal diseases – Diarrhea, dysentery and constipation.
- Peptic ulcer, Ulcerative colitis, Crohn's diseases, irritable bowel syndrome, Irritable Bowel Diseases.
- Cancer - Types, Aetiology, Signs and Symptoms, Diagnosis, Nutritional Requirements and Recommendations.

UNIT - IV

Types, causes, symptoms, diagnosis, dietary management of

- Obesity and Underweight
- Diabetes mellitus
- Cardiovascular diseases - Hypertension, Atherosclerosis, congestive cardiac failure. Sodium restricted diet.

UNIT – V

Types, causes, symptoms, diagnosis, dietary management of

- Disease of liver - Hepatitis, Cirrhosis, Jaundice, Liver failure and Transplant.
- Gall bladder diseases.
- Disease of the urinary tract - Nephritis, Nephrotic Syndrome, Urinary calculi and Renal failure.

Text Books:

1. Srilakshmi. B., (2019)., "Dietetics",. Eight Edition.,New Age International (P) Ltd., Chennai.
2. Williams. S.R. (2001) Basic Nutrition&Diet Therapy, 11th Edition., Mosby. Inc., St.Louis.
3. Brown. J.E. (2002) Nutrition Now, 3"& Edition. Wordsworth Thomson Learning. Inc. Canada.

Reference Book:

1. Garg. M., (2006), Diet Nutrition and Health, ABD Publishers.
2. Krause. M.V and Mahan. L.K., (2019), "Food Nutrition and Diet Therapy", 9th Edition, W.B. Sauders Company, Philadelphia.
3. Brown. J., (2014), "Nutrition now", 7th Edition, Wadsworth, USA.

Web Reference:

2. www.nin.res.in

3. https://eatright.org

SEMESTER- V	**CORE- VII**
20U5NDC07	
Credits- 5	**5 Hours/Week**

INSTITUTIONAL FOOD SERVICE MANAGEMENT

OBJECTIVE

To enable students:

1. Understand the principles of planning, organizing and controlling in food service institutions.
2. Understand the management aspects of food service
3. To develop managerial skills among the students.

CO LEVEL	COURSE OUTCOME	KNOWLEDGE LEVEL
CO1	To gain knowledge about various types of food service	**K1**
CO2	To know about the menu planning and Quantity food production	**K2**
CO3	To gain knowledge about the principles and functions of food service management	**K2**
CO4	To understand about Personnel Management and Financial Management	**K4**
CO5	To realize the Importance of Art, Sanitation and Hygiene in Food service Institutions.	**K3**

UNIT- I

Food Service Operation- Definition, Types- hotel, motel, Restaurant, Cafe and Chain Hotels, Development of Present-day food services.

Classification based on Function – Profit oriented, commercial, non-commercial- service and public health oriented.

Food service- Definition, Types- conventional, commissary, ready- prepared and assembly service, Styles- Waiter, self-service, tray service and portable meals- Transports, railways, airways.

UNIT – II

Kitchen layout - Definition, Features, Kitchen layout for food and beverage services.

Equipment- Classification, factors involved in selection, Methods of Purchase, Maintenance and care, electrical and non-electrical equipment involved in Food Service (list only).

Quantity Food Production- Forecasting, Scheduling, Production- Standardization of Recipe, Portion size and Control.

UNIT – III

Organisation - Types and Principles, Organisational Structure

Management – Definition, Functions, principles, Tools of Management- Organisational chart, Work study and Work improvement.

Leadership - Styles of Leadership and Qualities of a Good Leader.

UNIT – IV

Personnel Management - Personnel management -Definition, scope, Functions of a personnel manager, Job description and job specification, Process of Selection, Orientation and Training.

Financial Management - Cost account and keeping, inventory maintenance of account books, balance sheets, food Pricing and its methods, costing: concepts and controlling techniques; cost effective procedures, Concept of Break-Even Point (BEP)

UNIT- V

Art in food service - Elements of design, principles of design and Application of art in Table service- Flower arrangement-application of art principles in arranging flowers, styles and types, Napkin folding.

Hygiene and sanitation - Personal hygiene, types and sources of contamination, prevention, safety measures, methods of dish washing and Waste disposal.

Textbook:

1. Mohini Sethi (2020), "Institutional Food Management", II Edition, New Age International.
2. Mohini Sethi, SurjeetMathan, (2015), "Catering Management An Intergrated Approach", New Age International.

REFERENCE:

1. Earl R. Palan and Judity A. Stadler (1986) Preparing for the food service Industry, AVI Publishing& co
2. West B.B. Wood L. Harger V.P. (1966) Food Service in institutions John Willey And sons, Inc., New York.
3. J.M. Diwan (1997) Catering and food service Management, Common Wealth publishers.

SEMESTER- V	**CORE-VIII**
23U5NDC08	
CREDITS-5	**Hours/Week: 4**

COMMUNITY NUTRITION

OBJECTIVES:

To enable the students to,

- To Know the importance and needs for community nutrition
- To gain a knowledge on the various aspects of malnutrition, nutrition educationand nutritional status assessment.
- To know about intervention programs available

CO LEVEL	COURSE OUTCOME	KNOWLEDGE LEVEL
CO1	To gain insight into the nutritional problems and their implications.	**K1**
CO2	To know about the nutritional deficiency.	**K1**
CO3	To understand and know about the nutritional assessment	**K2**
CO4	To develop skills in organization nutrition projects in the community.	**K4**
CO5	To understand the importance of nutrition education.	**K4**

UNIT I

Background- Definition of malnutrition, under nutrition, over nutrition, community, family, village and block. Causes and consequences of malnutrition. The ultimate cost of malnutrition, Prevalence of malnutrition in India. Vicious cycle of malnutrition.
Food and nutritional security – Definition and importance

UNIT - II

Nutritional Deficiency Diseases -Prevalence, aetiology, signs, symptoms and control of anemia, osteoporosis and Osteomalacia, protein energy malnutrition, vitamin A deficiency, dental caries and Fluorosis.

Communicable Disease - Definition and classification. Causative organism, mode of transport, sign and symptoms, treatment and prevention and Immunization & Vaccination of the following- polio, Covid-19, diphtheria, diarrhea, pertussis, tetanus, measles, mumps and aids.

UNIT - III

Nutritional Assessment

Assessment of nutritional status of the community - Definition, objectives and importance

Growth motoring - Definition and significance.

Direct methods: Anthropometric, Biochemical, Clinical and Dietary. Standards for height, weight and Body Mass Index, Mid upper – arm circumference, chest circumference, waist – hip ratio. Body fat analysis and body composition analysis.

Indirect method: vital statistics, diet survey – need and important, methods, merits and demerits

UNIT - IV

Organizations for Nutrition: International Organization Co-operative American Relief Everywhere (CARE), World Health Organization (WHO), Food and Agricultural Organization (FAO), United Nations International Children Emergency Fund (UNICEF)

Nutrition Intervention Programmes: Integrated Child Development Scheme (ICDS), Midday Meal Scheme, free Breakfast Scheme, Public Distribution System (PDS), Supplemental Nutrition Assistance Programme (SNAP), PoshanAbhiyaan.

UNIT –V

Nutrition Education- Definition, methods, merits and demerits. Tools for Nutrition Education and Target Groups.

Extension Activity- Socio economic survey of a community, diet survey, Nutrition and health assessment and Nutrition education.

Text book:

1. Suryakantha A.H.,(2010)., Community Medicine with recent Advances, Jaypees brother medical publishers.
2. Shubhangini A Joshi.,(2002)., Nutritional and Dieteitcs., 2 Edition., Tata McGraw- Hill publishing company limited., New Delhi.
3. Besavanathappa.,(2000).,Community health Nursing, Jaypee Brother Medical Publishers Ltd., New delhi

Reference books:

1. Park. A.,(2007)., Textbook of Prevention and social medicine 15th Edition., M/S.Banarasidas, Bharat Publishers.
2. Bamji. M.S. Prahland Rao. N. Reddy.,(2004).,Textbook of human Nutrition, 2nd Edition., Oxford and PBH Publisher
3. Gibney.M.J., Maretts.,(2004).,Public Health Nutrition, Blackwell Publishers Co., UK.

SEMESTER – V	**ELECTIVE – 01**
20U5NDE01	
Credits – 4	**3 Hours/ Week**

PERFORMANCE NUTRITION

OUTCOME

The students will be able

1. To Gain knowledge on concept of sports, exercise and fitness.

2. To understand the metabolism of macro and micronutrients during performance

3. To Explain the Nutritional needs of sports person

CO LEVEL	COURSE OUTCOME	KNOWLEDGE LEVEL
CO1	The students could understand the concepts of Fitness, Sports and Exercise	**K1**
CO2	The students could understand the effect of exercise	**K1**
CO3	The students could analyze the nutritional consideration of sports person	**K4**
CO4	To Analyze the micronutrient needs during performance	**K4**
CO5	The students could be able to Apply the concepts and suggest a menu for sports person	**K5**

UNIT – I

Fitness - Definition, parameters of fitness, cardiovascular endurance, muscular strength, muscular endurance, physical fitness tests- for flexibility.

Sports and Exercise – Classification of Sports- power events, non-power events and skilled sports, Definition and examples of types of Sports- Endurance trained, intermittent strength and power. Types of Exercise – Aerobic and Anaerobic exercise, fuel for exercise, glycogen load.

UNIT - II

Health Club Equipment & Activities – Tread mill, hammer strength, steppers, cycles,body sculpting, kick boxing, Reebok ridge rocker, hanging, hand grips, swing, climbingand lifting weight.

Acute Response during exercise - Cardio respiratory system- effect of exercise on different types of exercise on cardiac cycle and Blood pressure. Respiratory system - effect of training on lung.

UNIT – III

Nutritional Consideration for Sports person

Carbohydrates- Fuel for aerobic and anaerobic metabolism, Glycogen re-synthesis, Carbohydrate loading.

Protein – Protein metabolism, Protein turnover and factors affecting it.

Fat- factors affecting fat oxidation (Intensity, duration, training status, CHO feeding)

UNIT – IV

Fluids – balance, importance, symptoms and prevention of dehydration.

Micronutrients – Influence of exercise on vitamins, Vitamin Restoration and Supplementation.

Dietary supplements – ergogenic aids- Nutritional, psychological and physiological.

Warm Up Exercises & Basic Asanas - Simplified physical exercises and body stretching practices. Basic asanas, Surya namaskar, breathing exercise- pranayama.

UNIT- V

Principles of Diet planning – Pre game meals, post-game meals, On-season meals and Off- season meals; liquid meals, high energy meal, Protein rich meals, Sports bar, MCT diet, Antioxidant rich diet.

Special Nutrition - Basic knowledge on sports nutrition, specialnutritional needs for seavoyage, military and space [basic only]

TEXT BOOKS:

1. Louise Burke, Greg Cox (2010) The Complete Guide to Food for Sports Performance, III Edition, National Library of Australia.
2. Fred Bronus, Cerestar Cargill (2022) Essential of Sports Nutrition, II Edition, John Wiley & Sons.
3. Dr.Balbindersingh (2020), Sports Nutrition and Weight Management, I Edition, Friends Publication.

REFERENCE BOOKS:

1. Werner W. K Hoejer (2022), Life time Physical Fitness and Wellness, XVI Edition, MortonPublishing Company, Colorado.

2. Mishra, S. C (2005) Physiology in Sports. Sports Publication, New Delhi

3. Swaminathan T, (2008) Essentials of Food and Nutrition Bangalore PrintingPublishing Co.

WEB REFERENCE:

1. https://www.nin.res.in

2. https://www.intechopen.com

3. https://jissn.biomedcentral.com

SEMESTER- V	**Skill Based Elective - III**
20U5NDS03	
CREDITS-2	**Hours/Week: 2**

BAKERY AND CONFECTIONERY

OBJECTIVES:

To enable the students to

1. Understand the importance of baking and confectionery.

2. Understand the principles, role of various food components involved in baking and confectionery.

3. Develop skills and responsibility for setting up bakery and confectionery units.

CO LEVEL	COURSE OUTCOME	KNOWLEDGE LEVEL
CO1	To know about the structure and composition of wheat / Maida / Cornflour	**K1**
CO2	To know about the baking ingredient and their process.	**K1**
CO3	To know about the baking & confectionery units and equipments. SOP	**K2**
CO4	To develop a skill about preparation and decoration of dough andtheir sensory evaluation, self-life, beverage of excess products, packaging machines and their methods.	**K4**
CO5	To know about the confectionary process and also usage of thermometer, pH meter.	**K4**

UNIT - I

Introduction to bakery - baking industry in India. History of bakery, Structure and Composition of the Wheat Kernel, Steps and By Products of Wheat Milling, Enrichment of Flour and Bread. Methods of making batters and doughs. Principles of Baking, Classification of Baked Foods.

UNIT – II

Baking ingredients and its role, Flour, Water, Yeast, Sugar, Shortening, Milk, Egg, Butter, Salt, Chemical Leavening Agents, Spices, Flavorings, Fruits and Nuts, Food Colors, Setting Materials, Cocoa and Chocolate, recipe balance, storage of baked products, selection of packaging materials. Millet based cooking meals.

UNIT - III

Preparation and Decoration of Baked Foods Bread Making – Steps and Methods, Role of Ingredients, Variety Breads, Qualities of a Good Loaf, Bread Faults Cake Making – Functions of Ingredients, Cake Mixing Methods, Types of Cakes, Cake Judging, Cake Faults and remedies Biscuit Making, Cookie Making and Pastry Making, Types and techniques of Icing, Frosting and fillings. Sensory evaluation of baked products- objective and subjective methods.

UNIT - IV

Factors for Setting up a Bakery Unit Factors to be considered for Setting up a Bakery Unit Types of ovens – construction and working of conventional and modern ovens. Equipments required to start a small bakery unit – classification of major & minor equipments – description, types, materials, usage of each. Maintenance of major and minor equipment and tools.

UNIT- V

Confectionery Processing of Raw Materials-Cocoa and Chocolate. Making of Toffee, Chocolates, Fruit Drops, Hard Boiled Candies (clear, hard, pulled, grained, filled), Soft candies (basic fondant, modified fondant like toffee, fudge, 30 marshmallows, gummies, jellies, chocolates) Bars, Chewing Gums, Special Confectionery Foods, role of major components,factors affecting quality of the product.

RELATED EXPERIENCE

Visit to Bakery units and Bakery outlets.

Text books:

1. Dubey, S.C. (2002), Basic Baking IV Edition, The Society of Indian Bakers, New Delhi.

2. Bakers Handbook on Practical Baking (1998) Compiled and Published by US Wheat Associates, New Delhi.

3. NIR Board, The Complete Technology Book on Bakery Products, National Institute of Industrial Research, New Delhi.

Reference books:

1. Neelam Khetarpaul, Raj Bala Grewal and SudeshJood,(2013), "Bakery science and cereal technology", Daya publishing house.

2. Avantina Sharma, (2006), "Text Book of Food Science and Technology", International Book Distributing Co., Chaman Studio Building, Charbagh, Lucknow, UP.

3. John Kingslee, (2014), "A professional text to Bakery and Confectionary", New Age International Publisher.

SEMESTER- V	**Skill Based Elective - III**
23U5NDSP01	
CREDITS-2	**Hours/Week: 2**

BAKERY AND CONFECTIONERY PRACTICALS

OBJECTIVES:

To enable the students to

- Understand the principles and practical difficulties of baking
- Develop skills and learn the art of baking
- Evolve as a budding entrepreneur

CO LEVEL	COURSE OUTCOME	KNOWLEDGE LEVEL
CO1	Identify the basic ingredients and methods employed in baking	**K1**
CO2	Prepare different types of breads	**K6**
CO3	Prepare different types of cakes with various Icings	**K6**
CO4	Prepare different types of Biscuits, Cookies and Brownies	**K6**
CO5	Prepare different types of candies, chocolates and puddings	**K6**

1. Demonstrate and identify
   a) Commonly used baking tools
   b) Commonly used raw ingredients
   c) Working principle & procedure of baking oven

2. Prepare different types of bread - Bread, Bun, Banana bread

3. Prepare any three types of cakes with different icings
   a) Sponge cake with butter cream icing, Glaze/ Caramel/ Fondant, Whipped cream icing.
   b) Cup cakes
   c) Tea cakes/ Fruit cakes

4. Prepare any 2 types of cookies and biscuits

5. Prepare brownies- basic brownie, one brownie with millet flour

6. Prepare a sugar candy and pudding of your choice.

REFERENCE BOOKS:

1. Yogambal Ashok Kumar, 2012, "Textbook of Bakery and Confectionary", PHN learning private ltd, New Delhi.

2. Carole Clements, 2015, "The Great Big Baking Book", Southwater Publications, USA.

3. Rose Levy Beranbaum, 2014, "The Baking Bible", Harvest Publishers, USA.

SEMESTER VI

SEMESTER – VI	**CORE - IX**
23U6NDC09	
CREDITS- 5	**6 Hours/ Week**

FOOD MICROBIOLOGY

OBJECTIVES:

To enable the students to

4. Learn about morphology and life cycle of different microorganisms

5. To know the food spoilage caused by various microorganisms

6. To know about the various types of poisoning and infections caused by microorganisms and to Study the preventive measures

COURSE OBJECTIVES:

CO1	Acquire the knowledge on the basic concepts of microbes in the food and human welfare.	**K2**
CO2	Relate the theoretical knowledge with microbes in environment	**K4**
CO3	Comprehend the knowledge gained on the characteristics of the microorganisms in food	**K2**
CO4	Understand the relevance of microbial spoilage of various foods and its intoxications	**K2**
CO5	Provide frame work on the concepts of quality control activities	**K7**

UNIT – I

Symbiosis, Commensalism, Antagonism, Mutualism, Parasitism, IIcterotrophic, Autotrophic,

Saprophytes, Holozoic, Culture, Medium (definition with examples only)

Classification of microorganisms, differences between eukaryotic and prokaryotic.
General characteristics of Bacteria, Virus, Fungi, Protozoa and Algae.

UNIT II

Bacteria and Virus - occurrence, morphology, Reproduction**.**

Mold - morphology, classification, reproduction, physiology and nutrition, genera of moldsimportant in foods

Algae - occurrence, morphology, classification, Reproduction and economic importance of Algae.

Yeast - morphology, classification, physiology and nutrition, process of hybridization and importance of yeast in foods

UNIT- III

Definition and types - Water activity and food spoilage

Food spoilage – Contamination of cereals and cereal products, Contamination of vegetables and fruits, Contamination of egg, Contamination of milk and milk products.

Contamination of meat & meat products, Contamination of fish, Contamination of poultry, contamination of sugar and sugar products.

Canned foods – Definition, objectives and Contamination of Canned foods.

UNIT- IV

Fermentation – Definition, types, microorganisms used in food fermentations

Fermented foods – Types, methods of manufacture for vinegar, sauerkraut, tempeh, beer and wine.

Food borne infection and Intoxification – Definition and Types.

Food poisoning by fungal toxins - Aspergillus, Pencillium, Fusarium

UNIT – V

Definition, symptoms and prevention - Staphylococcus, clostridium, Salmonella, Shigella and Campylobacter foods involved, incubation period.

Sewage - composition of sewage, typical organism in sewage (only). BOD definition and determination.

Fundamentals of control of microorganisms in food – extrinsic and intrinsic factors growth

Sterilization and disinfection – Definition and methods.

TEXT BOOKS:

4. M.R adams., M.O.Moss.,(2018).,Food Microbiology., New age international private limited
5. Bibek ray., ArunBhunia.,(2019)., Fundamentals of food microbiology(fourth edition)Taylor and francis Ltd
6. William C Frazier.,(2017)., Dennis C Westhoff., Foof Microbiology(fifth edition) McGraw Hill Education

REFERENCE BOOKS:

4. MR Adams, MO Moss, (1996), Food Microbiology, New Age International(P) Limited.
5. Micheal P. Doyle & Larry R. Beuchot, 3rd Edition, ASM Press, 2007.
6. Burton J. Bogitsh. Thomas C. Cheng, Human Parasitology, 2nd Edition, Academic Press.

WEB REFERENCES:

1. https://www.frontiersin.org
2. https://www.mdpi.com
3. https://onlinecourses,swayam2.ac.in

SEMESTER – VI	**CORE PRACTICAL - IV**
23U6NDCP05	
Credits - 2	**3 Hours/ Week**

FOOD MICROBIOLOGY PRACTICAL

OBJECTIVES:

To enable the students to

3. To understand the key concepts in food microbiology

4. To gain knowledge on various methods of microbial analysis of food and dairy product

COURSE OBJECTIVES:

CO1	To understand the significance and activities of microorganisms in food	**K2**
CO2	To understand and describe the characteristics of important pathogens and spoilage microorganisms in food and dairy	**K2**
CO3	To recognize and describe the characteristics of important pathogens and spoilage microorganisms in food	**K4**
CO4	To gain knowledge on various methods of microbial analysis of food and dairy products	**K4**
CO5	To learn various methods for their isolation, detection and identification of microorganisms in food.	**K5**

PRACTICALS

5. Straining method (Gram's staining, spore staining, negative and flagella staining)
6. Isolation and identification of yeast and molds in bread (LCP/KOH, Germ tube method)
7. Microscopic identification of water Algae (Spirulina/ Cyanobacteria/oscilatoria)
8. Milk qualitative test (MBRT/ Resazurin)
9. Isolation and identification of culture characterization of food spoilage bacteria.

REFERENCE:

1. Dr. R.C. Dubey and Dr.Maheshwari (2010)., Practical Microbiology., Chand. S publisher.
2. Osman Erkemen and T. FarukBozoglu (2016), Food Microbiology, 1st edition, Wiley

SEMESTER- VI	**CORE PAPER - X**
23U6NDC10	
CREDITS-4	**Hours/Week: 5**

FOOD SAFETY AND QUALITY CONTROL

OBJECTIVES:

To enable the students to:

1. To understand the principles and application of food quality.

2. To communicate about the safe and quality food production.

3. To know about the sensory evaluation.

CO LEVEL	COURSE OUTCOME	KNOWLEDGE LEVEL
CO1	To gain knowledge about physio-chemical changes in foods.	**K1**
CO2	To gain knowledge on sources, uses, properties and changes in starches sugars, proteins and browning reactions.	**K1**
CO3	To gain knowledge about protein in foods and sensory evaluation	**K2**
CO4	To know about the quality evaluation of foods	**K4**
CO5	To gain knowledge about common food adulterants and toxins and enzymes.	**K4**

UNIT –I

Principles of Quality control -An Introduction:

Food Quality- Introduction, Meaning, Importance, Quality parameters, Indicators of quality in different foods.

Quality Control – Meaning, Advantages, Food Quality Control Procedures.

Food specifications – Meaning, Objectives, Importance of Food Specifications and Types of Food Specifications.

UNIT –II

Quality control Measure

a) **Food specifications for various food products** –cereals, pulses, fruits and vegetables, milk and milk products, fats and oils, spices and condiments and beverages – carbonated and non – carbonated beverages, canned and baked foods
b) **Food Additives & their specifications**: -Classification of food additives, usages and optimal level recommended for usage as specification –Food colors, leavening agents, preservatives.

UNIT – III

Quality evaluation of food

a) Subjective Evaluation: Sensory characters of food, organs involved in assessment –physiological process, types of sensory tests, requirements to conduct sensory evaluation, defects in sensory evaluation-panel member, essential qualities of a panel member, procedure of sensory evaluation.
b) Objective Evaluation: Texture Analysis- Definition of hardness, adhesiveness, viscosity, chariness, gumminess, sponginess and fraction ability and their Tools.

UNIT – IV

Food contaminants and adulterants

a) Food Toxins –Mycotoxins –aflatoxins, aspergillus and penicillium species, mushroom poisoning, sea food toxins.
b) Food hazards-physical, chemical and biological hazards.
c) Food adulteration and Food standards; Adulteration –Definition, Common food adulterants; tests for detecting food adulterants, contamination with toxic metals, pesticides and insecticides; effects of food adulteration and contamination, measures to control food adulteration. Prevention of food adulteration Act.

UNIT – V

a) International Agencies: Codex Alimentarius Commission, FAO/WHO, FDA
b) National- FSSAI, Food laws, AGMARK, BIS- Functions, and Registration Procedure.
c) Consumer- Definitions, Consumer Protection Act, Machinery for Redressal of Consumer grievances.
d) Intellectual Property Rights- Definition, Importance, Patent law in India.
e) Food Safety Assurance- GAP, GMP, GHP, FSMS- ISO 22000 and ISO 9001.
f) HACCP- Concept, definition, principles and functions.

Text book

1. Swaminathan. M., (2000).,Hand book of food science and experimental foods, Bangalore.
2. Swaminathan. M., (2010)., Essentials of food and Nutrition., Volume II., Bangalore.
3. Srilakshmi.B., (2010)., Food science, New Age International publishers, New Delhi.

Reference book

1. Potter.N and Hotchkiss J.H., (2000)., Food Science., 6th Edition., CBS Publication and Distribution, New delhi.
2. EillianH.Mayer., (2011)., Food chemistry., Affiliated East West Press pvt, Ltd, New Delhi.

PrabodhHalde and Sanjeevkumar., (2013)., Objective food science and standards., Jain brotherS

UNIT – IV

Food contaminants and adulterants

d) Food Toxins –Mycotoxins –aflatoxins, aspergillus and penicillium species, mushroom poisoning, sea food toxins.

e) Food hazards-physical, chemical and biological hazards.

f) Food adulteration and Food standards; Adulteration –Definition, Common food adulterants; tests for detecting food adulterants, contamination with toxic metals, pesticides and insecticides; effects of food adulteration and contamination, measures to control food adulteration. Prevention of food adulteration Act.

UNIT – V

g) International Agencies: Codex Alimentarius Commission, FAO/WHO, FDA

h) National- FSSAI, Food laws, AGMARK, BIS- Functions, and Registration Procedure.

i) Consumer- Definitions, Consumer Protection Act, Machinery for Redressal of Consumer grievances.

j) Intellectual Property Rights- Definition, Importance, Patent law in India.

k) Food Safety Assurance- GAP, GMP, GHP, FSMS- ISO 22000 and ISO 9001.

l) HACCP- Concept, definition, principles and functions.

Text book

1. Swaminathan. M., (2000).,Hand book of food science and experimental foods, Bangalore.
2. Swaminathan. M., (2010)., Essentials of food and Nutrition., Volume II., Bangalore.
3. Srilakshmi.B., (2010)., Food science, New Age International publishers, New Delhi.

Reference book

3. Potter.N and Hotchkiss J.H., (2000)., Food Science., 6th Edition., CBS Publication and Distribution, New delhi.
4. EillianH.Mayer., (2011)., Food chemistry., Affiliated East West Press pvt, Ltd, New Delhi.

Prabodh Halde and Sanjeevkumar., (2013)., Objective food science and standards., Jain brotherS.

SEMESTER – VI	**SBEC- 04**
20U6NDS04	
Credits – 2	**2 Hours/ Week**

FOOD PRODUCT DEVELOPMENT AND MARKETING

OBJECTIVES:

1. Understand and know various aspects of food product development including Food Science and Technology
2. Develop new marketable, nutritionally and economically viable food products
3. Develop entrepreneurship skills for setting up small scale food industries

CO LEVEL	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO1	The students could gain knowledge in Phases of Food product development	**K2**
CO2	The students could understand the concept of Idea generation	**K2**
CO3	The students could gain knowledge On New product screening techniques	**K3**
CO4	The students could understand the development process	**K2**
CO5	The students could analyze the market trends and sustainability of the developed product	**K4**

Unit I: Food consumption pattern

Trends in Food Consumption pattern. Economical, Psychological and Sociological Dimensions of Food Consumption patterns. Trends in Social Change as a Base for New Product Development

Unit II: Introduction to Food Processing & Product Development

Food Components, Types of Food Processing, Status of Food Processing Industry in India and Scope of Growth in Future Principles and Purpose of New Product Development, Product Design and Specifications.

Unit III: Recipe Development

Traditional Foods, Weaning Foods, Convenience Foods, RTE, RTS, Extruded foods, IMF Foods, Specialty Products, Health foods, Nutritional Supplements, Functional Foods, Nutraceuticals and Designer Foods, Sports Foods.

Unit IV: Testing, Evaluation and Packaging of Products

Standardization, Portion size, Portion Control, Quantity Cooking, Shelf-Life Evaluation-Sensory and Nutrient Analysis.

Suitable Packaging Materials for Different Foods, SWOT Analysis

Unit V: Financial Management and Marketing of Food Products

Institutional Support (Training and Finance) for Entrepreneurship Development. Financial Institutions (Central and State Government) banks/Funding agencies, Financial accounting Procedures, market Research, marketing Strategies, Cost Calculation, Advertising Methods, Product sales, Product License, Legal specifications, Consumer behavior and Food Acceptance.

Textbooks

1. *Sudhir Gupta (2007) Handbook of Packaging Technology,* Engineers India Research Institute, New Delhi
2. *Khanaka, S.S., Entrepreneurial Development,* S. Chand and Company Ltd, New Delhi, 2006.
3. Avantina Sharma .,(2005)., "New food Product Development", CBS publisher and Distribution Press, Florida.

Reference Books :

1. *Suja, R. Nair(2004) Consumer Behaviour and Marketing Research*, 1st Edition, Himalaya Publishers.
2. *Hmacfie,(2007) Consumer led Food Product Development,* Weedhead Publishing Ltd., UK
3. *Fuller, Gordon, W(2005) New Food Product Development*, 2nd Edition, CRC Press, Boca Raton, Florida,
4. *Schaffner .D,J, Schroder , W.R.(2000)Food Marketing and International Perspectives,* Web/McGraw Hill Publication

Journals:

1. International Journal of Food Science and Technology
2. Food Technology
3. Journal of Food Technology
4. Trends in Food Science and Technology Critical Reviews is Food Science and Nutrition

SEMESTER – VI
Credits - 2
23U6NDE02

ELECTIVE – II
3 Hours / week

ELLECTIVE II - FOOD PACKAGING AND LABELLING

OBJECTIVES

1. Understand the basic concepts of food packaging
2. Understand the various properties of food packaging materials.
3. To impart knowledge and skills related to designing packaging system in food products

CO1	The students will be able to acquaint with various food packaging materials	**K1**
CO2	The students learn standards of food packaging materials	**K2**
CO3	The students understand process involved in food packaging methods	**K3**
CO4	The students could gain knowledge on testing on food packaging	**K4**
CO5	The student could understand the packaging of different food products	**K5**

UNIT I: Introduction to Food Packaging

Packaging – Definition, Importance of Packaging, Functions of Packaging, Requirements, Characteristics of Packaging. Levels of Food Packaging – Primary, Secondary & Tertiary Packaging. Types of food packaging materials – Paper, Paperboard, Plastics, Glass and Metals.

UNIT II: Packaging Materials

Methods of Packaging - Vacuum Packaging, Controlled Atmospheric Packaging, Modified Atmospheric Packaging, Aseptic Packaging, Biodegradable packaging, Active and Intelligent Packaging, Recent Development in Packaging.

UNIT III: Packaging of Specific Foods

Packaging used for different food commodities – Cereals & Pulses, Fruits and Vegetables, Milk, Meat, Poultry and Fish.

UNIT IV: Standards & Testing of Food Packaging

Packaging – Laws and Regulation. Testing of food packaging materials, testing of package performance, possible interactions of between food, package and environment, total package performance testing, package testing programme.

UNIT V: Food Labelling

Definition, Importance of food labelling, Purpose of Labelling, Content of Labelling.

Nutrition Labelling: Meaning, Principles and codex guidelines of nutritional labelling, Labelling provision in existing food laws.

Text Book

1. Robertson GL (2013). Food Packaging: Principles and Practice, 3rd Edition, CRC press, US
2. Richard Coles, Mark J. Kirwan (2011), Food and Beverages Packaging Technology, (2nd Edition), Wiley-Blackwell
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