SRI SATHYA SAI INSTITUTE OF HIGHER LEARNING

(Deemed to be University)

Syllabus for

B.Sc. in Food and Nutritional Sciences

PrasanthiNilayam – 515 134
Anantapur District, Andhra Pradesh,
Tele: (08555) 287239, Fax: 286919
Website: www.sssihl.edu.in;Email: registrar@sssihl.edu,in

B.Sc. in Food and Nutritional Sciences

The B.Sc. in Food and Nutritional Sciences Programme Structure consists of Three Parts.

PART-I: LANGUAGES#

(a) General English (four papers offered, one each in the first four semesters)
(b) Another Language (four papers offered, one each in the first four semesters – Any one out of: HINDI / SANSKRIT / TELUGU / ADDITIONAL ENGLISH)

PART-II: CORE SUBJECTS

(Offered in all the six semesters) – Title of the papers are given below in the Scheme of Instruction & Evaluation and the syllabus contents are enclosed.

PART-III: AWARENESS COURSE and ENVIRONMENTAL COURSE##

a) Awareness Courses – (UAWR) (six papers offered, one each in all the six semesters)
b) Environnemental Courses– (UENT) (two papersoffered, one each in the first two semesters)

NOTE: The title of the papers and the syllabus contents of Part-I and Part-III are provided separately.

Scheme of Instruction and Evaluation

(Effective 2016-17 batch onwards)

Food and Nutritional Sciences

Paper Code	Title of the Paper	Credits	Hours	Modes of Evaluation	Types of Papers	Maximum Marks
Semester I						
UGEN-101	General English-I #	5	5	IE1	T	100
	Another Language-I #	4	4	IE1	T	100
UFNS-101	Introductory Food Science	3	3	IE1	T	100
UFNS-102	Applied Chemistry	3	3	IE1	T	100
UFNS-103	Human Physiology	3	3	IE1	T	100
UFNS-104	Practical: Introductory Food Science	1	3	I	P	50
UFNS-105	Practical: Applied Chemistry	1	3	I	P	50
UFNS-106	Practical: Human Physiology	1	3	I	P	50
UAWR-100	Awareness Course – I: Education for Transformation (Based on Life and Teachings of Bhagawan Baba)	2	2	I	T	50
UENT-101	Environment-I: Environmental Studies and Human Values	2	2	I	T	75
		25 credits	**31** hours			**775** Marks

Semester II						
UGEN-201	General English-II #	5	5	IE1	T	100
	Another Language-II #	4	4	IE1	T	100
UFNS-201	Biochemistry	3	3	IE1	T	100
UFNS-202	Microbiology	3	3	IE1	T	100
UFNS-203	Principles of Culinary Science and Art	3	3	IE1	T	100
UFNS-204	Practical: Biochemistry	1	3	I	P	50
UFNS-205	Practical: Microbiology	1	3	I	P	50
UFNS-206	Practical: Principles of Culinary Science and Art	1	3	I	P	50
UAWR-200	Awareness Course – II: Unity of Religions	2	2	I	T	50
UENT-201	Environment-II: Environmental Studies and Human Values	2	2	I	T	75
		25 credits	**31** hours			**775** Marks

Semester III						
UGEN-301	General English-III #	5	5	IE1	T	100
	Another Language-III #	4	4	IE1	T	100
UFNS-301	Fundamentals of Nutrition	4	4	IE1	T	100
UFNS-302	Basic Food Chemistry	4	4	IE1	T	100
UFNS-303	Food Preservation Techniques	4	4	IE1	T	100
UFNS -304	Practical: Fundamentals of Nutrition	1	3	I	P	50
UFNS -305	Practical: Basic Food Chemistry	1	3	I	P	50
UFNS-306	Practical: Food Preservation Techniques	1	3	I	P	50
UAWR-300	Awareness Course – III: Eternal Values for the Changing World	2	2	I	T	50
		26 credits	**32** hours			**700** Marks

Semester IV						
UGEN-401	General English-IV #	5	5	IE1	T	100
	Another Language-III #	4	4	IE1	T	100
UFNS-401	Human Nutrition	4	4	IE1	T	100
UFNS-402	Bakery and Confectionery	3	3	IE1	T	100
UFNS-403	Nutrition in Health	4	4	IE1	T	100
UFNS-404	Computer Basics and Applications	1	3	I	P	50
UFNS -405	Practical: Human Nutrition	1	3	I	P	50
UFNS -406	Practical: Bakery and Confectionery	1	3	I	P	50
UFNS-407	Practical: Nutrition in Health	1	3	I	P	50
UAWR-400	Awareness Course – IV: Study of Classics - I: Bhagawath Vahini	2	2	I	T	50
		26 credits	**34** hours			**750** Marks

Semester V						
UFNS-501	Functional Foods and Nutraceuticals	4	4	IE1	T	100
UFNS-502	Dietetics	4	4	IE1	T	100
UFNS -503	Sports Nutrition	3	3	IE1	T	100
UFNS-504	Institutional Food Management	4	4	IE1	T	100
UFNS -505	Ergonomic Science	3	3	IE1	T	100
UFNS-506	Practical: Dietetics and Sports Nutrition	2	6	I	P	50
UFNS-507	Practical: Institutional Food Management and Ergonomic Science	1	3	I	P	50
UAWR-500	Awareness Course – V: Study of Classics - II: The Ramakatha Rasavahini	2	2	I	T	50
		23 Credits	**29** hours			**650** Marks

Semester VI						
UFNS-601	Food Product Development	3	3	IE1	T	100
UFNS-602	Food Processing Technologies	4	4	IE1	T	100
UFNS-603	Food Quality Assurance and Evaluation	4	4	IE1	T	100
UFNS-604	Community Nutrition	4	4	IE1	T	100
UFNS-605	Nutrition in Emergencies and Disasters	3	3	IE1	T	100
UFNS-606	Practical: Food Product Development , Food Processing Technologies and Food Quality Assurance & Evaluation	2	6	I	P	50
UFNS-607	Practical: Community Nutrition	1	3	I	P	50
UAWR-600	Awareness Course – VI: Life and its Quest	2	2	I	T	50
		23 Credits	**29** hours			**650** Marks
	GRAND TOTAL	**148** Credits	**186** hours			**4300** Marks

Modes of Evaluation

Indicator	Legend
IE1	CIE and ESE ; ESE single evaluation
IE2	CIE and ESE ; ESE double evaluation
I	Continuous Internal Evaluation **(CIE)** only Note: 'I' does not connote 'Internal Examiner'
E	End Semester Examination **(ESE)** only Note: 'E' does not connote 'External Examiner'
E1	ESE single evaluation
E2	ESE double evaluation

Continuous Internal Evaluation (CIE) & End Semester Examination (ESE)

Types of Papers

Indicator	Legend
T	Theory
P	Practical
V	Viva voce
PW	Project Work
D	Dissertation

PS: Please refer to guidelines for 'Modes of Evaluation for various types of papers', and 'Viva voce nomenclature & scope and constitution of the Viva voce Boards'.

B.Sc. in Food and Nutritional Sciences

Programme Objectives:

B.Sc.(Food and Nutritional Sciences) is a three year (six semesters) programme offered at Anantapur Campus of the Institute. Candidates with subject combinations in XII Standard of Mathematics/Physics/Chemistry or Botany/Zoology/Chemistry are eligible to apply.

The programme is designed to provide an understanding of both the biological and social science perspectives. Students receive basic theoretical and practical training in three major areas—Public Health Nutrition, Dietetics & Food Science and Quality Control—which can be their chosen career specializations for further postgraduate or doctoral research study.

Programme Specific Objectives:

The nutritionist plays an increasingly important role as health has become a mainstream and topical issue in society. The programme is a scientific study of health and chemical aspects of food. It provides a strong academic training in nutrition and the related disciplines of food science, physiology, biochemistry and microbiology. Students will get a thorough understanding of the role of diet and nutrition in health and the prevention of major diseases.

The programme content is wide and varied, ranging from the key scientific properties of food to the development of new and innovative food products. It provides an exciting opportunity for students to develop an in-depth scientific understanding of food, as well as important critical thinking and innovation skills needed by the food industry.

UFNS-101 INTRODUCTORY FOOD SCIENCE

Credits: 4 (Theory – 3, Practical – 1) **Theory hours : 45**

Course objectives:

To enable the students to:

1. Know the classification of foods into different groups.
2. Gain knowledge about the composition and nutritive value of different foods.
3. Understand the different methods of cooking food.

Course outcomes:

The students will be able to:

1. Describe the basic food groups, food components and their nutritive value.
2. Recognize various methods and principles of cookery for different food groups.
3. Demonstrate skills to use appropriate cooking method for various food groups.

THEORY

Unit I	**Food groups** Definition of food, food as source of nutrients, food composition and its relation to food groups and functions of foods	3 h
Unit II	**Food preparation** Methods of cooking (moist, dry and combination), their advantages and disadvantages and effects on nutritive value.	4 h
Unit III	**Cereals** Structure of wheat and rice, Composition and nutritive value of specific cereals (wheat, rice, maize, oats, rye and barley) and millets (pearl millet, finger millet, sorghum); methods of cereal cookery.	4 h
Unit IV	**Pulses** Composition and nutritive value of certain beans, lentils and peas, toxic constituents of pulses, methods of pulse cookery.	4 h
Unit V	**Nuts and oilseeds** Composition and nutritive value of certain nuts and oilseeds (almonds, cashews, coconut, groundnut, walnut, flaxseed, soya bean, sesame and	2 h

sunflower); role of nuts and oilseeds in cookery.

Unit VI **Vegetables** 3 h

Classification (bulbs, roots, tubers, fruits, flowers, leaves, legumes, stem, seed sprouts, fungi and algae) composition and nutritive value of green leafy vegetables, tubers, roots and other vegetables, methods of vegetable cookery.

Unit VII **Fruits** 4 h

Classification (citrus, drupes, berries, grapes, melons, plums, tropic and sub-tropical fruits), composition and nutritive value.

Unit VIII **Milk cookery** 4 h

Composition of milk and nutritive value, properties of milk, types of milk and milk cookery.

Unit IX **Fish, poultry and meat** 4 h

Classification, nutritive value and methods of cooking.

Unit X **Egg** 4 h

Structure and composition, selection and grading, characteristics of stale and fresh eggs, methods of cooking eggs.

Unit XI **Oils and fats** 3 h

Nutritive value, functions of oils and fats; sources of fats: animal (butter, lard, margarine) and plants (groundnut, sesame, palm, coconut, sunflower, soya bean).

Unit XII **Sugar** 2 h

Nutritive value, forms of sugars and stages of sugar cookery.

Unit XIII **Flavouring agents** 2 h

Different spices and condiments and their flavoring principles, role of spices in cookery.

Unit XIV **Beverages** 2 h

Coffee, tea, cocoa, fruit beverages and soft drinks.

UFNS-104 PRACTICAL: INTRODUCTORY FOOD SCIENCE

Unit I Standard measurement of raw and cooked foods

Unit II Determination of edible portion of foods

Unit III Methods of cooking – for different food groups:

a) Moist heat – boiling, simmering, steaming, pressure cooking.
b) Dry heat methods – braising, roasting, panning and baking.
Fat as a medium of cooking – sautéing, shallow fat frying and deep fat frying.

Unit IV Stages of sugar cookery.

Reference Textbooks:

1. Bennion M. Introductory foods, McMillan Publishing Co. 1985.
2. Manay SN and Shadaksharaswamy M. Foods: Facts and Principles, New Age International (P) Ltd. New Delhi. 2010.
3. Srilakshmi B. Food Science, New Age International Pvt. Ltd. India. 2018.

Suggested Readings:

1. Mathew S. Practical Manual of Introductory Foods, Agrobios (India), Jodhpur. 2001.
2. Mudambi SR and Rajagopal, MV. Fundamentals of Foods and Nutrition, New Age International (P) Ltd., Publishers, 4thedn, New Delhi. 2008.

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UFNS-102 APPLIED CHEMISTRY

Credits: 4 (Theory – 3, Practical – 1) **Theory hours : 45**

Course objectives:

To enable the students to:

1. Acquire knowledge about the principles of physical chemistry and its aspects
2. Understand the applications of physical chemistry with special reference to foods
3. Learn the fundamentals of chemistry of bio-macromolecules

Course outcomes:

The students will be able to:

1. Display an understanding of the fundamental concepts in the field of physical chemistry with special reference to foods
2. Describe the structure, functions and the transformations of macromolecules
3. Demonstrate practical knowledge about identification tests for bio-macromolecules
4. Express units of concentration of a solution and prepare them

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THEORY

Unit I **Physico-chemical properties** 5 h

Vapor pressure, boiling point, freezing point, viscosity, interfacial tensions and specific gravity with special reference to foods.

Unit II **Solutions** 6 h

Solubility- Expressing concentration of a solution (molar, normal and molal) ; diffusion, osmosis, semi-permeable membrane- selective semi-permeable membrane ; comparison of osmotic pressures (biological method), isotonic and iso-osmotic solutions; plasmalysis and haemolysis; osmoregulation in plants and animals. Elementary account of Donnan membrane equilibrium.

Unit III **Acids, bases and buffers** 4 h

Concept of acids, bases and buffers with special reference to foods and human body.

Unit IV **Colloids** 5 h

True and colloidal solutions – lyophobic and lyophilic colloids; coagulation and protection of lyophobic and lyophilic colloids; kinetic,

optical and electrical properties of colloids. Applications of colloids.

Unit V Carbohydrates 8 h

Classification- important chemical reactions of aldoses and ketoses – isomerism, open chain and ring structures, Classification, structure and functions of oligosaccharides and polysaccharides. Identification of glucose, galactose, fructose, ribose, maltose, lactose and sucrose.

Unit VI Fatty acids and Fats 8 h

Classification and reactions of fatty acids and fats. Characterization of fats. Structure and identification test for cholesterol.

Unit VII Amino acids 4 h

Classification, structure and important chemical reactions of amino acids. Colour reactions and identification tests for amino acids.

Unit VIII Proteins 5 h

Classification, structure (elementary), functions and identification tests for proteins.

UFNS-105 PRACTICAL: APPLIED CHEMISTRY

Unit I Preparation of standard solutions

Preparation of normal and molar solutions

Unit II Qualitative tests for the detection of

a) Carbohydrates : Tests for sugars (including preparation of osazones)

b) Proteins and amino acids: Simple test for amino acids and proteins- Ninhydrin test, Biuret test, Millon's test, Xanthoproteic test, etc.

c) Oils and cholesterol

Unit III Determination of physical properties of fats and oils

a) Solubility

b) Specific gravity

c) Refractive index

Reference Textbooks:

1. West ES, Todd WR, Mascon HS, Van Bruggen JT. Textbook of biochemistry. Oxford and IBH Publishing; 1974.
2. Bahl BS, Bahl A and Tuli GD. Essentials of Physical Chemistry, S. Chand & Co.,

New Delhi.2005.

Suggested Readings:

1. Rama Rao AVSS. A Textbook of Biochemistry for Medical Students, UBS Publishers' Distributors Ltd., New Delhi. 2000.
2. Sathyanarayana U. Biochemistry, Books and Allied Pvt. Ltd. Kolkata. 2010.

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UFNS -103 HUMAN PHYSIOLOGY

Credits: 4 (Theory – 3, Practical – 1) **Theory Hours : 45**

Course objectives:

To enable the students to:

1. Gain basic knowledge of human anatomy and physiology.
2. Understand different physiological systems of the body and their functions.
3. Acquire knowledge about physiological changes and importance of hormonal regulation of the body functions.

Course outcomes:

The students will be able to:

1. Recognize and describe the structure of the cell, tissues and organs of the body.
2. Explain the physiological functions of various organs and systems in the human body.
3. Develop a vocabulary of appropriate terminology to effectively communicate information related to human anatomy and physiology.
4. Analyze the physiological changes in the human body with age and the influence of hormones.
5. Display skills in the use of few equipment and techniques in the study of human physiology.

THEORY

Unit I	**Cell structure and tissues**	
	Structure and functions of cell, tissues, organs and organ systems.	6 h
Unit II	**Digestive system**	
	Brief study of the anatomical organization of the digestive tract; physiological sites of digestion, absorption and assimilation of food.	4 h
Unit III	**Circulatory system**	
	Heart structure and functions, regulation of cardiac output, blood vessels, lymph vessels and their function.	5 h
Unit IV	**Blood and Lymph**	
	Composition and functions of blood and lymph. Blood coagulation, grouping and transfusion.	3 h
Unit V	**Respiratory system**	
	Basic anatomy of the respiratory system. Process of respiration.	5 h

Transport and exchange of oxygen and carbon dioxide in the body.

Unit VI Excretory system 4 h

Excretory organs- structure and functions, formation of urine, composition of urine.

Unit VII Endocrine system 5 h

Structure and functions of pituitary, thyroid, parathyroid, adrenal body and pancreas. Disorders of endocrine glands.

Unit VIII Reproductive system and mammary glands 8 h

Anatomy of the male and female reproductive organs. Menstural cycle – conception, contraception and parturition. Brief anatomy of mammary glands and secretion of milk.

Unit IX Immune system

Immunity, immunization and inflammation. 5 h

UFNS-106 PRACTICAL: HUMAN PHYSIOLOGY

Unit I Histological examination

a) Observation and identification of various tissues (slide specimens)
b) Observation of mammalian viscera (models).

Unit II Hematology

a) Determination of haemoglobin – Shali's method.
c) Demonstration of coagulation of blood and blood grouping.
e) Demonstration of bleeding time and clotting time

Unit III Recording pulse rate and measurement of blood pressure at normal state and after exercise

Unit IV Organ systems

Study of different organ systems in man – by models.

Reference Textbooks:

1. Cecie Starr and Beverly McMillan. Human Biology. Wadsworth Group, U.S.A. 2011. 11th Edn.
2. Chatterji C C. Human Physiology. Vol. 1 and 2. Medical Allied Agency, Calcutta, India. 2003. 11th Edn.

3. Anatomy and Physiology. Textbook equity edition, vol.2, Open State College, Rice University, Houston, Texas. 2013.

Suggested Readings:

1. Dee Unglaub Silerthorn. Physiology: An integrated approach. Pearson Education Publishers, India. 2018. 7thEdn.
2. Elaine N Mariab. Essentials of human anatomy and physiology. Pearson Education Publishers, India. 2016. 10thEdn.

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UFNS- 201 BIOCHEMISTRY

Credits: 4 (Theory – 3, Practical – 1) **Theory Hours: 45**

Course objectives:

To enable the students to:

1. Understand the principles of biochemistry
2. Learn about the metabolism of bio-macromolecules
3. Know the basics of enzymology and the role of various coenzymes in metabolic pathways

Course outcomes:

The students will be able to:

1. Describe the metabolic pathways of important bio-macromolecules
2. Demonstrate an understanding of the regulation of biochemical processes with special reference to enzymes and co-enzymes
3. Demonstrate a comprehensive understanding regarding energy compounds and mechanism of energy production.

THEORY

Unit I	**Enzymes** Classification, nature, mode of action, specificity, activation and inhibition. Factors affecting enzyme catalyzed reactions.	6 h
Unit II	**Coenzymes** Role of vitamins as coenzymes in the metabolism of carbohydrates, proteins and fats.	8 h
Unit III	**Carbohydrate metabolism** Interconversion of hexoses in liver. Anaerobic and aerobic oxidation of glucose (glycolysis, Krebs tricarboxylic acid cycle, hexosemonophosphate shunt), gluconeogenesis, glycogenesis and glycogenolysis.	8 h
Unit IV	**Lipid metabolism** Oxidation and synthesis of fatty acids, synthesis of triglycerides and phospholipids, synthesis of cholesterol.	8 h
Unit V	**Protein metabolism** Essential and non-essential amino acids. Metabolic reactions of amino	8 h

acids, i.e., transamination, deamination, decarboxylation, transmethylation and transamidination. Urea cycle, Protein synthesis.

Unit VI **Bioenergetics** 4 h

Free energy, exergonic and endergonic reactions. High energy compounds. Electron transport chain and oxidative phosphorylation.

Unit VII **Nucleo proteins** 3 h

Structure and functions of DNA & RNA and their role in protein synthesis

UFNS-204 PRACTICAL: BIOCHEMISTRY

Unit I **Starch and sugars**

a) Acid hydrolysis of disaccharides and starch
b) Determination of reducing sugars

Unit II **Proteins and amino acids**

a) Determination of proteins by Biuret method
b) Determination of amino acids by ninhydrin method

Unit III **Fats**

a) Determination of acid value of fats and oils
b) Determination of saponification value of fats and oils
c) Determination of iodine value of fats and oils
d) Determination of peroxide values of oils.

Reference Textbooks:

1. Mallikarjuna Rao N. Medical Biochemistry, New Age International Pvt. Ltd, Publishers, Hyderabad. 2002.
2. Satyanarayana U. Biochemistry, Books and Allied Pvt. Ltd. Kolkata. 2010.
3. Raghuramulu N, Nair KM and Kalyansundaram S. A manual of laboratory techniques. National Institute of Nutrition, Hyderabad. 2003.

Suggested readings:

1. Conn EE, Stump PK, Bruening G and Doi RH. Outlines of Biochemistry, John Wiley and Sons.1987.
2. Murray RK, Granner DK, Mayes PA and Rodwell VW. Harper's Biochemistry, Appleton and Lange, Connecticut, USA. 2002. 25th Edn.

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UFNS-202 MICROBIOLOGY

Credits: 4 (Theory – 3, Practical – 1) **Theory Hours: 45**

Course objectives:

To enable the students to:

1. Know about the microbes in the environment, their general characteristics and classification.
2. Appreciate the value of sanitation and understand that personal health is dependent on clean air, water, food and surroundings.
3. Learn the basic techniques of microbiology.

Course outcomes:

The students will be able to:

1. Display an understanding of the fundamental concepts of microbiology.
2. Demonstrate an understanding of diversity of microorganisms using specific examples.
3. Can cite examples of the vital role of microorganisms in food fermentation, medicine, and other industries important to human well being
4. Explain the indispensable role of microorganisms in the environment, including elemental cycles, biodegradation, etc.

THEORY

Unit I **Introduction to microbiology** 2 h

Historical perspectives, scope of microbiology, classification of microorganisms (prokaryotes and eukaryotes).

Unit II **Bacteria- Morphology, structure and applications.** 5 h

Bacterial morphology – size, shape and arrangement of bacterial cells; Structures external to the cell wall – flagella, pilli, capsules, sheaths, etc.; Cell wall – structure and chemical composition; Structures internal to the cell wall – the cytoplasmic membrane, protoplasts; spheroplasts, cytoplasmic inclusions and vacuoles, nuclear material and spores and cysts; Beneficial uses of bacteria.

Unit III **Cultivation of bacteria** 6 h

Nutritional requirements – Nutritional types of bacteria; bacteriological media – types of media, preparation of media; physical conditions required for growth – temperature, gaseous requirement, pH and miscellaneous physical requirement; growth – normal growth

cycle (growth curve) of bacteria and growth phases; pure and mixed cultures; methods of isolating pure cultures; maintenance and preservation of pure cultures.

Unit IV **Eukaryotes and other microorganisms** 6 h

Algae, protozoa, viruses, and fungi: general characteristics, classification, important applications and harmful effects.

Unit V **Microbiology of foods** 6 h

Primarysources of microorganisms in foods; intrinsic and extrinsic parameters of foods that affect microbial growth in foods; food spoilage- causes, types and mechanism of food spoilage; microbial spoilage of milk, fruits ,vegetablesand beverages, fresh and cured meats, eggs, fish,cold stored and frozen foods.

Unit VI **Control of microorganisms** 8 h

Principles of microbial control and overview of use of:

Physical agents – High temperature (sterilization, pasteurization, appertization), low temperature (chilling and freezing), irradiation, high pressure processing (pascalization), drying and filtration.

Chemical agents – Disinfectants and chemical preservatives.

Antibiotics and other chemotherapeutic agents –Antibiotics: characteristics, types and mode of action, antifungal agents, use in foods.

Unit VII **Microbes in the environment** 6 h

Microorganisms in soil (nitrogen cycle and nitrogen fixing bacteria).

Microorganisms in fresh waterand domestic water; water purification and chlorination; standards for potable water.

Microorganisms in air: significance and enumeration; control of airborne microorganisms.

Airborne, waterborne and other infectious diseases (typhoid, cholera, diphtheria, pertusis, small pox, measles and influenza)

Unit VIII **Microbial food borne illness** 6 h

Food infection and intoxication/poisoning; Bacterial agents (*E. coli, Salmonella, Shigella, Staphylococcus, Clostridium, Listeria, and Bacillus cereus*); Non-bacterial agents (*Giardia lamblia, E. histolytica, Aspergillus* sp., Hepatitis and Gastroenteritis viruses).

UFNS- 205 PRACTICAL: MICROBIOLOGY

Unit I	Use of microbiological equipment – Microscope, Autoclave, Incubator, Inoculation chamber/Laminar air flow, colony counter.
Unit II	Examination of micro-organisms in air, water, milk, moldy bread.
Unit III	Examination of permanent slides/specimens of pathogenic and useful microorganisms.
Unit IV	Staining of Bacterial smears: simple and gram staining.
Unit V	Demonstration of bacterial cultivation: Preparation and sterilization of media -inoculation and incubation.

Reference Textbooks:

1. Adams M R and Moss MO. Food Microbiology, New Age International Pvt. Ltd., New Delhi. 1996.
2. Cliver DO. Food Borne Diseases Academic Press, Inc. London 1990.
3. Frazier WC. Food Microbiology, New Willey Publications. 1999.
4. Tauro P, Kapoor KK and Yadav KS. An Introduction to Microbiology, New Age International Pvt. Ltd., New Delhi. 1990.

Suggested Readings:

1. Pawar CB and Daginawala HF. General Microbiology, Himalaya Publishing House, Nagpur, India. 1998.
2. Pelczar MJ, Reid RD and Chan ECS. Microbiology, Tata McGraw Hill, 1998. 6thEdn.
3. Sharma P D. Microbiology, Rastogi Publications, Meerut, India. 2001.
4. Talaro K and Talaro A. Foundations in Microbiology, Winc Brown Publishers, USA. 2001.

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UFNS-203 PRINCIPLES OF CULINARY SCIENCE AND ART

Credits: 4 (Theory – 3, Practical – 1) **Theory hours : 45**

Course objectives:

To enable the students to:

1. Understand the scientific principles and the aesthetic art involved in cuisine preparation.
2. Develop culinary vocabulary and skill sets related to culinary science and art
3. Learn the methods and importance of sanitation and safety in food preparation
4. Obtain knowledge regarding basic concepts of ayurvedic cuisine and nutrition.
5. Familiarize students to the diversity in Indian cuisine

Course outcomes:

The students will be able to:

1. Use appropriate culinary terminology to describe food products and processes.
2. Employ standard measurement techniques in food preparation.
3. Demonstrate proficiency when using culinary techniques, culinary equipment and tools during food preparation.
4. Apply basic principles and practices of cleaning and sanitation during food preparation.
5. Demonstrate skills in plating and presentation of foods.
6. Identify traditional culinary trends and regional cuisines of India.
7. Explain the basic principles of Ayurvedic cuisine.

THEORY

Unit I Introduction 5 h

Cuisine: Meaning, Course Objectives of food preparation - palatability, variety, safety, digestibility and nutrient retention. Cuisine as a science and art: Food components and their interaction, influence of temperature, light and air, aesthetic and cultural aspects. Culinary terminologies of Indian and modern cuisines.

Unit II Culinary methods and techniques 8 h

Review of cooking methods - roasting, broiling, steaming, boiling, pressure cooking, poaching, frying, stewing, braising, pot roasting, baking. Basic computation, weighing and measuring of foods. Anatomy of kitchen knife, types of kitchen knives and other cutting tools. Cutting techniques and types of cut: Julienne, Brunoise, Mirepoix, Fermier, Paysanne, Chiffonade, roll cutting, slicing, crushing, parallel cutting. Special techniques used in Indian cuisines.

Unit III Safety and sanitation

8 h

Principles of sanitation (preventive cleaning process; sterilization process), personal hygiene; principles of safe storage: safe holding temperature for foods; sanitary refrigeration, safe cooling and reheating of foods; safe techniques for knife skills and hand tools; equipment use and care (heating equipments, refrigerator, juicers, mixing and grinding devices, gas range, steamers; water filters); basic safety measures for safe working.

Unit IV Food presentation styles

8 h

Basic elements of presentation (colour, texture, shape, simplicity, balance). Garnishes- meaning; steps in garnishing; types and tips of garnishing; tools for garnishing and decoration. Examples of garnishes and decoration used in Indian cuisine. Plating and food layout.

Unit V Indian traditional foods and cuisine

8 h

History and evolution; Regional cuisines of India- Traditional foods of south Indian, north Indian, west Indian and east Indian cuisine; Specialty ingredients in regional cuisines – herbs, spices, *masala* powders and cooking oils of different regions.

Unit VI Ayurvedic cuisine

8 h

Basic tenets of Ayurveda: Five elements, *tridhatus*, relationship between *tridosha* and five elements, *saptadhatus*. Principles of ayurvedic cuisine: Qualities of food- *rasa, guna, virya, vipaka*and*prabhava*. Balanced diet- ayurvedic perspective. Food and the cycles of nature; *Viruddhaahara* - imbalance in food components. Dietary rules and etiquettes.

UFNS-206 PRACTICAL: PRINCIPLES OF CULINARY SCIENCE AND ART

Unit I Culinary techniques

1) Familiarization with different types of cutting and paring tools and their safe handling
2) Demonstration and practice of:
    a) Shredding of fruits and vegetables using chef's knife/French Knife
    b) Peeling fruits/vegetables with paring knife and vegetable peelers
    c) Slicing with slicing knives/serrated slicer
    d) Chopping coriander leaves/cabbage with chef's knife
    e) Mincing of onions by professional style
    f) Crushing of ginger and Garlic
    g) Types of cuts: Julienne, dicing, roll-cutting, scooping, shredding, parallel

cutting.

3) Garnishes and decorations

a) Familiarization of garnishing tools: Apple cutter/corer, brushes, butter curler and paddles, candy molds, citrus stripper, decorating bags and tips, grapefruit knife, hand grater, small cookie cutter, melon baller, scissors, skewers and toothpicks and wire strainers.
b) Common garnishes used in Indian cuisine: Chopped coriander leaves, coriander sprigs, tomato julienne, onion rings, tomato rose, ginger julienne, cream swirl/ dollops, rogan, slit green chili, sprinkling masala/chilli powders, fried chilli and curry leaves, sauted and roasted seeds (cumin), saffron threads.
c) Demonstration/practice of citrus garnishes and decoration (Grooved lemon slices, lemon butterflies, orange julienne, candied citrus peel, citrus knots and loops), strawberry fans and flowers, bell pepper rings, cups and baskets, carrot curls and flowers, cucumber ribbons and watermelon bowl/basket.

UnitII **Demonstrationand presentation of various traditional cuisines**

1. Demonstration of selected traditional foods from cuisine of South India, North India, East India and Western parts of India using special techniques used in Indian cuisine: Adding yoghurt, browning of onions, preparation of curry base, cooking spice paste, natural colorings, dry roasting, spices in oil, ground spices, tempering, thickening agents, uses of herbs and extracts.
2. Traditional and modern meal layout and plating styles.

Reference Textbooks:

1. Wyane Gisslen. Professional Cooking. John Wiley& Sons, New Jersey. 2015. 8th edn.
2. Jagmohan Negi. Fundamentals of Culinary Art. S. Chand and Company Pvt. Ltd., New Delhi. 2013.
3. Jagmohan Negi. Food Presentation Techniques (Garnishing and Decoration). S. Chand and Company Pvt. Ltd., New Delhi. 2013.
4. Eva Medved. Food Preparation and Theory. Prentice-Hall Inc., Englewood Cliffd, New Jersey. 1986.

Suggested Readings:

1. Vaidya Atreya Smith. Ayurvedic Nutrition. MotilalBanarsiDass Publishers Pvt. Ltd, Delhi. 2011.
2. Vanaja Ramaprasad and Vaidya S.R. Sudarshan. Aharatattwa.
3. SibelÖzilgen. Cooking as a chemical reaction – Culinary Science with experiments. CRC Press, Boca Raton, Florida. 2015.

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UFNS -301 FUNDAMENTALS OF NUTRITION

Credits: 5 (Theory – 4, Practical – 1) **Theory Hours : 60**

Course objectives:

To enable the students to:

1. Gain knowledge on the functions, food sources and requirements of essential nutrients.
2. Learn about dietary reference intakes, RDA and dietary values.
3. Understand the adverse effects of inadequate intake of nutrients.
4. Apply the knowledge in maintenance of good health for the individual and community.

Course outcomes:

The student will be able to:

1. Describe the relationship between nutrition, health and development.
2. Display knowledge about dietary reference intakes, RDA and dietary values.
3. Make healthy food choices based on the knowledge about importance of various nutrients.
4. Identify common nutritional deficiencies
5. Apply the principles of nutrition to ensure good health for the individual and community.

THEORY

Unit I Introduction to the study of nutrition 5 h

Relationship between food, nutrition and health; brief history of nutrition; dietary reference intakes (DRI) – RDA and daily values (DV) and dietary guidelines for reference man and reference woman; Basis for estimation of nutrient requirements, formulation of RDA and RDA for Indians.

Unit II Energy 10 h

Units of energy; Energy value of foods- gross and physiological values; Measurement of energy content of food (direct and indirect methods); Components of energy expenditure; Basal metabolic rate (BMR) - definition, factors affecting and determination of BMR; Energy requirements for various age groups.

Unit III Energy yielding food factors- carbohydrates, proteins and fats 15 h

Classification, sources, digestion, absorption, functions, requirements of carbohydrates, proteins and fats; Energy protein malnutrition – classification, etiology, clinical and biochemical symptoms, prevention and treatment; Role of low cost locally available food and food mixes

in the treatment of malnutrition

Unit IV **Vitamins** 13 h

Historical background, structure, functions, deficiency and requirements of water soluble vitamins - thiamine, riboflavin, niacin, pyridoxine, folic acid, cyanocobalamin and ascorbic acid and fat soluble vitamins: A, D, E and K.

Unit V **Minerals** 13 h

Historical background, structure, functions, deficiency and requirements of macrominerals - calcium, phosphorus, magnesium and trace minerals - iron, iodine, zinc, copper and fluoride.

Unit VI **Water and electrolytes** 4 h

Body water distribution, functions, requirements; Concept of water balance- regulation of water; Maintenance and regulation of acid base balance.

UFNS-304 PRACTICAL: FUNDAMENTALS OF NUTRITION

Unit I Estimating energy requirements using factorial method.

Unit II Calculating nutritive value of foods from food composition tables.

Unit III Planning and preparing a balanced diet.

Unit IV Categorization of foods as rich, moderate and poor sources of energy and nutrients.

Unit V Planning and preparation of recipes rich in energy, protein, fibre, calcium, iron, zinc, pro-vitamin A, vitamin C, folic acid, thiamine, riboflavin and niacin.

Reference Textbooks:

1. Swaminathan M. Essentials of food and nutrition, vol. I and II, Ganesh and Co., Chennai, India. 2010.
2. Sumati R Mudambi and M V Rajagopal. Fundamentals of food and nutrition, New Age International Pvt. Ltd. Publishers, New Delhi, India. 2007.
3. Nutrient Requirement and recommended dietary allowances for Indians. B.S. NarasingaRao and B. Shivakumar (Eds.), National Institute of Nutrition, ICMR, Hyderabad. 2010. 2nd Edn.
4. Gopalan C, Rama Shastri B V, Balasubramanian. Nutritive value of Indian Foods. B.S. NarasingaRao, Deosthale Y G and Pant K C (Eds.), National Institute of Nutrition, ICMR, Hyderabad. 2012.

Suggested Reading:

1. Hester H Vorster, Michael J Gibeny, Susan A, Laham-New, Aedin Cassidy. Introduction to human nutrition, John Wiley and Sons Ltd. Publishers, U.K. 2013.

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UFNS- 302 BASIC FOOD CHEMISTRY

Credits: 5 (Theory – 4, Practical – 1) **Theory Hours : 60**

Course objectives:

To gain knowledge about:

1. The composition and chemistry of foods in relation to food processing and quality.
2. The functional properties of food components and their applications.

Course outcomes:

The student will be able to:

1. Name and describe the general chemical nature of the major components of food.
2. Describe the changes in the properties of these foods during processing.
3. Explain the chemistry of pigments, colorants and flavor compounds in foods and their changes during food processing.
4. Demonstrate sufficient knowledge of food chemistry to control reactions in foods and practical proficiency in maintaining product quality.

THEORY

Unit I Water 3 h

States of water; chemical and physical properties; free, bound & entrapped water; water activity.

Unit II Carbohydrates 15 h

Simple sugars: mono and disaccharides; physical properties of sugars- hygroscopicity, solubility, sweetness; chemical properties – hydrolysis, caramelization, maillard reaction; functional properties of sugars; Natural and alternative sweeteners.

Oligosaccharides: Classification, occurrence and uses in foods.

Polysaccharides: Starch- structure (amylose and amylopectin); sources and functional properties-gelatinization and factors affecting gelatinization, gelation,retrogradation, dextrinization and hydrolysis of starch (maltodextrins and dextrins);Modified starches – pregelatinized starch, oxidized starches, cross-linked starches, thin boiling starches;Resistant starch.Food applications of native and modified starch.

Non starch polysaccharides: Pectins, gums & seaweeds- gel formation & viscosity.Fiber- Cellulose & hemicellulose; food sources, functional role and uses in foods

Unit III Proteins

8 h

Review of protein structure & conformation; Properties & reactions of proteins in food systems: dissociation, optical activity, solubility, hydration, swelling, foam formation & stabilization, gel formation, emulsifying effect, thickening and binding, protein denaturation; Texturized proteins.

Unit IV **Lipids**

10 h

Review of chemistry and classification of fats and fatty acids; Physical properties of fats and oils: crystal formation, polymorphism, melting points, plasticity, isomerisation; Chemical reactions of fats:polymerization and rancidity; Modification of fats: hydrogenation-cis and trans isomers, interesterification, acetylation, winterization; Food sources, functional role and uses in foods: colour, flavor, texture, shortening power of fats, tenderization, emulsification, frying (smoke point, auto oxidation, polymerization); fat replacers.

Unit V **Enzymes**

8 h

Nomenclature and classification; specificity of enzyme reactions; enzyme inhibitors; enzymatic browning; enzymes as aids in food processing operations – carbohydrases, proteases, lipases, oxido-reductases.

Unit VI **Colloidal dispersions and emulsions**

4 h

Dispersions: types (emulsions, sol, gel and foam) and characteristics; emulsions: types, formation and factors contributing to stability; emulsifying agents.

Unit VII **Pigments and colourants**

8 h

Natural pigments (carotenoids, anthocyanins, chlorophyll, myoglobin and haemoglobin)- chemistry, occurrence, properties and changes during food processing; Natural and synthetic colourants: sources, permissible levels and use in foods.

Unit VIII **Flavour**

4 h

Natural flavor compounds – Fatty acids, alcohols, esters, aldehydes,ketones,phenols, sulphur compounds.Flavour enhancers, synthetic flavouring substances.

UFNS-305 PRACTICAL: BASIC FOOD CHEMISTRY

Unit I **Colligative properties of solutions**

a) Boiling point of water and effect of adding sugar/NaCl on elevation of

boiling point.

b) Freezing point of water and effect of adding sugar/NaCl on depression of boiling point.

Unit II **Carbohydrates: Properties and applications in food**

a) Sugar crystallization- crystalline and amorphous candies.
b) Gelatinization and gelation of different starches: Quality characteristics and effect of sugar and acid addition.
c) Thickening capacity of starches: Application of white sauce as thickeners in recipes.

Unit III **Protein in culinary transformations**

Protein gels (Yoghurt) and protein denaturation (Cottage cheese).

Unit IV **Fats and oils**

Determination of smoke point in different oils.

Unit V **Enzymes in foods**

a) Demonstration of enzymatic browning in apples
b) Methods to prevent enzymatic browning.

Unit VI **Plant pigments**

Determining changes in plant pigments on blanching using paper chromatography.

Reference Textbooks:

1. Margaret McWilliams. Foods- Experimental Perspectives, Prentice Hall, Inc. New Jersey. 2003.
2. Dominic WS. Wong. Mechanism and theory of Food Chemistry, AVI publishing, New York. 1989.
3. Frank A. Lee. Basic Food Chemistry. AVI publishing, USA. 1983.
4. Margaret McWilliams. Experimental Foods Laboratory Manual, Prentice Hall, Inc. New Jersey. 2012.

Suggested Readings:

1. Lillian Hoagland Meyer. Food Chemistry. AVI Publishing, New York. 1982.
2. Richard Owusu-apenten. Introduction to Food Chemistry, CRC Press, Boca Raton, Florida. 2005.

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UFNS- 303 FOOD PRESERVATION TECHNIQUES

Credits: 5 (Theory – 4, Practical – 1) **Theory Hours : 60**

Course objectives:

To enable the students to:

1. Understand scientific principles underlying food storage and preservation.
2. Learn the principles and processes of different methods of food preservation.
3. Develop skills and techniques in food preservation for ensuring safety, conservation of nutrients, and palatability.

Course outcomes:

The students will be able to:

1. Identify spoilage symptoms in fresh, minimally processed and processed foods and relate the same to the causes of food spoilage.
2. Demonstrate an understanding of technologies used in the preservation of foods in terms of their principles, mode of action, materials and equipment employed.
3. Explain emerging non-thermal technologies for processing and preservation of foods and their relevance to the food industry.

THEORY

Unit I **Food spoilage** 4 h

Causes of food spoilage; Types of spoilage, physical and chemical changes during spoilage, principles of food preservation, shelf-life dating of foods.

Unit II **Food preservation ingredients** 4 h

Classification of preservatives- Class I and class II preservatives. The use of antimicrobials, antioxidants, antimicrobial enzymes, and bio preservatives.

Unit III **Preservation techniques** 32 h

- Drying and dehydration: Introduction, concept of water activity, modes of heat transfer, factors affecting drying rate, drying rate curves, description of selected driers used for food materials.

- Thermal preservation: Classification and principles of thermal preservation methods, canning and bottling systems for processing of acid and nonacid foods, spoilage of canned foods.

- Refrigeration and freezing: Principle involved, properties of refrigeration and freezing, changes during freezing, freezing methods.

- Pickling and curing: Principles, action of preservatives, types of pickles and curing of meat.

- Infrared processing of foods: Sources, processing, mechanism of action, effects and application of infrared processing.

- Microwave processing of foods: Factors affecting microwave heating, safety of microwave processed foods, application of microwave processing in food.

Unit IV **Non-thermal methods of food preservation** 10 h

High pressure processing, pulsed electric field processing, oscillating magnetic field processing, ultrasound processing, pulsed light processing, ozonation.

Food irradiation: sources of radiations, units of radiation, dose and dosimetry, effects and application of irradiation to different foods.

Unit V **Preserved products** 8 h

Hurdle technology: concept, application of hurdle technologies in foods.

Jams, jellies, squashes, marmalades: definition, types, composition, pectic substances present in fruits, methods of determination in food extracts, extraction of pectin from fruit, theory of jelly formation, and difficulties in jelly making.

Unit VI **Evaluation of quality of preserved food products** 2 h

Subjective and objective methods of measuring quality of preserved food products

UFNS- 306 PRACTICAL: FOOD PRESERVATION TECHNIQUES

Unit I Preservation of foods by drying – *vadiams*, *vathals*, and *papads*.

Unit II Preservation of foods by fermentation – pickles; quick and fermented pickles.

Unit III Preservation of foods by concentration -jams, jellies, marmalades, squashes,

and *murabbas.*

Unit IV Preservation of foods using class I and class II preservatives- *podies*, *chutneys* and sauces.

Reference Textbooks:

1. Norman N. Potter. Food Science, AVI Publishing Company. 1996.
2. Peter S. Murano. Understanding Food Science and Technology, Woodsworth Learning, INC., USA. 2010.
3. Sandeep S. Food Preservation. Sarup and Sons, New Delhi. 1999.
4. Shirley J, Vangarde and Margy Woodburn. Food Preservation and Safety – Principles and Practice. Surabhi Publication, Jaipur.1999.
5. Srivastava RP and Kumar S. Fruit and Vegetable Preservation. International Book Distributing Co., Lucknow.1988.
6. Alluwalia V. Food Processing, Paragon International Publishers, New Delhi.2007.

Suggested Readings:

1. CFTRI. Home Scale Processing and Preservation of Fruits and Vegetables – CFTRI, Mysore. 1996.
2. Sabarwal B. Food Composition and Preservation. Commonwealth Publishers, New Delhi. 1999.

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UFNS-401 HUMAN NUTRITION

Credits: 5 (Theory – 4, Practical – 1) **Theory hours : 60**

Course objectives:

To enable the students to:

1. Understand health functional properties of micro and macronutrients
2. Learn about the factors affecting energy and nutrient requirements.
3. Gain insights in to interrelationship between nutrients.

Course outcomes:

The students will be able to:

1. Describe the role of macronutrients and micronutrients in human health.
2. Apply the knowledge of biochemistry and physiology to human nutrient metabolism.
3. Explain the mechanisms of action and interactions of the nutrients.

THEORY

Unit I Body composition 2 h

Definition, concept of homeostasis, factors affecting changes in body composition, methods for determination of body composition.

Unit II Energy 8 h

Components of energy requirements: BMR, RMR, thermic effect of feeding, physical activity, Factors affecting energy requirements; Methods of measuring energy expenditure and estimating energy requirements; Energy balance – Concept and regulation (set point theory), control of food intake - role of leptin and other hormones.

Unit III Carbohydrates 10 h

Review of sources, classification and nutritional significance of carbohydrates; Role of dietary carbohydrates on glycemic response, glycemic index and glycemic load of foods. Dietary fibre - types, sources, role and mechanism of action in health and disease.

Unit IV Proteins 10 h

Review of sources, nutritional classification and significance of proteins; Factors affecting protein requirements and bioavailability. Vegetable vs animal protein in meeting protein requirements; protein quality evaluation- PER, DC, BV, chemical score, PDCAAS, DIAAS.

Unit V Lipids

8 h

Review of sources, nutritional classification and significance of fats; Nutritional significance of fatty acids: SFA, MUFA, PUFA - functions and deficiency; Sources and functions of n-3 and n-6 fatty acids.

Unit VI Vitamins

10 h

Review of structure, chemistry, sources, functions and requirements of fat soluble vitamins - A, D, E, K and water soluble vitamins - thiamin, riboflavin, niacin, pantothenic acid, pyridoxine, folic acid, vitamin B_{12}, biotin and ascorbic acid. Metabolism - digestion, absorption, transport, storage and elimination; Bioavailability and factors affecting bioavailability; Interaction with other nutrients.

Unit VII Macrominerals

6 h

Review of structure, chemistry, sources, functions and requirements of calcium, phosphorus and magnesium. Metabolism - digestion, absorption, transport, storage and elimination; Bioavailability and factors affecting bioavailability; Interaction with other nutrients.

Unit VIII Microminerals and electrolytes

8 h

Review of structure, chemistry, sources, functions and requirementsof iron, copper, manganese, iodine, zinc, selenium, sodium, potassium and chloride. Metabolism- digestion, absorption, transport, storage and elimination; Bioavailability and factors affecting bioavailability; Interaction with other nutrients.

UFNS-405 PRACTICAL: HUMAN NUTRITION

UNIT I Nutritional analysis of foods

a) Moisture
b) Ash
c) Total carbohydrates
d) Total lipids
e) Proteins by Lowry's method
f) Crude fiber
g) Minerals - calcium, phosphorus and iron
h) Vitamin C by titration

UNIT II Demonstrations

a) Energy content of foods using Bomb calorimeter
b) Total proteins by Micro- Kjeldhal method

Reference Textbooks:

1. Bender D A. Introduction to nutrition and metabolism, CRS Press. 2014. 5th Edn.
2. Michael J Gibney, Ian A M and Helen M R. Nutrition and metabolism. Blackwell Publishing Co. U.K. 2003.
3. Michael J Gibney, Hester H V and Frans J K (Eds.). Introduction to human nutrition, Replika Press Pvt. Ltd., India. 2003. 2nd Edn.

Suggested Readings:

1. Christos S. Nutrition and metabolism. Human Press, Springer Nature, Switzerland. 2009.
2. Sander T and Emery P. Molecular basis of human nutrition. Taylor and Francis, London. 2003.

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UFNS-402 BAKERY AND CONFECTIONARY

Credits: 4 (Theory – 3, Practical – 1) **Theory Hours : 45**

Course objectives:

To enable the students to:

1. Understand the role of various food components in baking.
2. Gain understanding of methods of baking, and the interaction of the elements used for baking.
3. Expand their knowledge related to the art of decoration of baked foods and confectionery items.
4. Acquire basic skills in baking and confectionery.

Course outcomes:

The students will be able to:

1. Describe the properties and functions of various ingredients and equipment used in the production of baked foods.
2. Recognize, produce, preserve and use a variety of doughs, batters, and fillings for baking with a sound understanding of mixing methods and baking techniques.
3. Classify and prepare basic confectionary products.

THEORY

Unit I	Baking – Principles, classification of baked products.	3 h
Unit II	Ingredients used for baking – Role of ingredients like flour, yeast, sugar, egg, butter, salt, baking powder and other ingredients.	5 h
Unit III	Recipe balancing.	2 h
Unit IV	Preparation methods for: Bread – bread making methods, bread faults – causes and remedies. Cake – basic method of cake preparation and variety cakes, cake faults – causes and remedies. Biscuits and cookies – basic methods of biscuit and cookies preparation, common faults – causes and remedies. Pastries – preparation of pastries like – Puffs, Danish, Flaky varieties, pastry faults – causes and remedies.	10h

Unit V	Decoration of baked foods – types and techniques of icing, frostings and fillings	4 h
Unit VI	Storage and evaluation (objective and subjective methods) of baked products .	2 h
Unit VII	Sugar confectionery – types, role of sugar in preparation, other ingredients and their role in preparation, hard candies – (clear, hard, pulled, grained, filled); soft candies – basic fondant, modified fondant like toffee, fudge, marshmallows, gums, jellies, chocolates – properties of these candies.	6 h
Unit VIII	Indian confectionary / Sweets – Types, preparation, ingredients and their role in preparation. Types – milk/khoa based *burfis, gulabjamun, rasgulla,* flour based- *jelabi, besan based laddo, Mysore pak.*	3h
Unit IX	Nutritional aspects of bakery products.	3 h
Unit X	Standards and Statutory regulations for bakery products	3 h
Unit XI	Selection of packaging materials and packaging design	2 h
Unit XII	Bakery machinery and equipment.	2 h

UFNS-406 PRACTICAL: BAKERY AND CONFECTIONARY

Unit I: Preparation of products leavened by yeast

a) Yeast Breads
b) Buns
c) Pizzas

Unit II: Preparation of products using food acid–baking soda–leavening system

a) Biscuits – Melting moments, Coconut, Butter
b) Cookies – Chocolate chip, Gingerbread
c) Cakes – Sponge, Chocolate, Fruit

Unit III: Preparation of pastry

a) Pie pastry
b) Flaky pastry

Unit IV: Decoration of baked foods

a) Icings
b) Frostings

Unit V: Preparation of selected sugar confections

a) Crystalline – Fondant, fudge
b) Amorphous – Caramels, peanut brittle
c) Chocolates with different centres

Reference Textbooks:

1. Ashok Kumar Yogambal. Textbook of Bakery and Confectionary. PHI publisher, . 2009. 2nd Edn.
2. Isabel Moore. Baking Course – Pastry, Cakes and Bread. Royoon Publishing Company, London. 1984.
3. Kingslee John. Bakery and confectionary. New age international (P) limited. 2006.
4. Stanley Cauvain and Lind Young. Baked Products, Blackwell Publishing, Oxford. 2006.

Suggested Readings:

1. Andrey Eliis . Modern Cake Decorating. Hamlyn Publishing Group, England. 1976.
2. Smith A. The Art of Sugar Craft – Sugar Paste. Merchurst Press, London. 1987.
3. Evelyn Wallace. Cake Decorating and Sugar Craft. Hamlyn Publishers, England. 1967.
4. Pat Ashby. The Art of Sugar Craft and Chocolate. Merchurst Press, London. 1986.
5. Rosemary W. Cakes and Cake Decorating. Octopus Publishing, London. 1979.
6. Ursula Solom. The Low–Carb Baking and Dissect Cook Book, John Wiley & Sons, New Jersey. 2004.

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UFNS –403 NUTRITION IN HEALTH

Credits: 5 (Theory – 4, Practical – 1) **Theory Hours : 60**

Course objectives:

To enable the students to:

1. Understand the basic principles of meal planning.
2. Gain a comprehensive understanding of nutrition in different stages of life cycle.
3. Understand the relationship between nutrition, growth and development.
4. Familiarize with nutrition concerns and dietary recommendations for various age groups and physiological conditions.
5. Understand the principles of primary health care and the impact of social and cultural factors on food choice and health of individuals and families.

Course outcomes:

The students will be able to:

1. Recognize the importance of food and nutrition in the maintenance of health and prevention of disease.
2. Assess the nutritional needs and provide recommendations for groups and individuals for each phase of the life span considering social and cultural factors.
3. Plan and prepare nutritious meal for various age groups and income levels.
4. Give the principles of nutritional needs for astronauts.

THEORY

Unit I **Definition of health and nutrition** 2 h

Definition of health, nutrition and fitness related terms. Dimensions of health (physical, psychological, emotional and spiritual).

Unit II **Meal planning** 6 h

Basic concepts and importance of meal planning. Principles of meal planning-underlying factors which should be considered before planning meals, use of weights and measures, selection of major food groups, An over view of balanced diets and food exchange lists.

Unit III **Nutrition during lifespan**

a)Pregnancy: Physiological changes during pregnancy, Effect of nutritional status on pregnancy outcome. the desirable weight gain, nutritional requirements, complications during various stages of pregnancy, nutritional related problems during pregnancy, diet for pregnancy. 8 h

	b)Lactation: Role of hormones in milk production, Effect of mother's diet on composition and output of milk, nutritional requirements, effect of malnutrition on nutritional status of nursing mothers, methods to improve their nutritional status, diet for lactating women.	8 h
	c)Infancy: Growth and development during infancy, nutrient requirements, importance of breast feeding. Differences between human milk and animal milk, bottle feeding, types of artificial milk, methods of formula preparation, dietary requirements, complimentary and supplementary foods, Pre-term and low birth weight babies, nutritional requirements and feeding problems.	10 h
	d**) Toddlers, and preschoolers**: Growth and development, nutritional requirements, balanced diets during pre-school years, good food habits and healthy food choices, Nutrition related problems of preschoolers: protein energy malnutrition, Vitamin-A and iron deficiency anemia	5 h
	e) School children: Nutritional requirements, significance of breakfast, factors to be considered for planning school lunches, importance of nutrition education diet for school children.	5h
	f) Adolescence: Growth and development, nutritional requirements of boys and girls-diet for adolescent boys and girls, nutrition related problems of adolescents .	5h
	g)Adulthood nutrition: Nutrition for adults, basis for requirements, RDA, nutritional guidelines, concerns and dietary requirements. Nutrition and work efficiency.	5h
	h) Geriatric nutrition: Ageing process, changes that occur during ageing, nutritional concerns in old age and management. Nutritional guidelines and dietary requirements for old people.	4h
Unit IV	**Space nutrition:** Physiological changes and altered nutritional requirements for an astronaut. Food systems for space.	2h

UFNS- 407 PRACTICAL: NUTRITION IN HEALTH

Unit I	Weights and volume measurements of raw and cooked foods; Use of food exchange list.
Unit II	Planning and cooking the day's meals for the family belonging to various income groups a) old man, b) adult man and woman, c) adolescent, d) elementary schooler and a pre-schooler.
Unit III	Planning and preparing meals for pregnant and lactating woman belonging to various income groups, comparing their actual intake with the

recommended amounts.

Unit IV Planning and preparation of infant weaning foods.

Reference Textbooks:

1. ICMR. Indian Council of Medical Research, Recommended Dietary Intakes for Indians, ICMR, New Delhi. 2010.
2. Mudambi SR and Rajagopal MV. Fundamentals of Foods, Nutrition and Diet Therapy, New Age International Publishers, New Delhi. 2007.
3. Robinson CH. Normal and Therapeutic Nutrition, The Oxford and IBH Publishing Co.1982.
4. Seth V and Singh K. Diet planning through life cycle: Part 1. Elite publishing house pvt Ltd, New Delhi.2006.
5. Swaminathan M. Advanced Textbook on Food and Nutrition, The Bangalore Printing and Publishing Co. Ltd., Bengaluru, India. 2008.

Suggested Reading:

1. Mahtab S Bamji, Kamala Krishna Swamy and G N V Brahmam. Textbook of Human Nutrition. Oxford and IBH Publishing, New Delhi. 2009.

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UFNS-404 COMPUTER BASICS AND APPLICATIONS

Credit: 1 (Practical–1)

Course objectives:

To enable the students to:

1. Acquire knowledge in basic features of Microsoft office, windows basics and file management.
2. Develop familiarity with internet basics, email and accessing internet.

Course outcomes:

The students will be able to:

1. Apply different data and text processing software to create documents, presentation and analysis.
2. Use computers to access academic data bases for education, information and research.

Unit I: Computer fundamentals -2 h

a. Over view about computers
b. Components of computers
c. Input/output devices
d. Secondary storage devices
e. Number systems: decimal, binary, octal, hexadecimal
f. Representation of information: BCD, EBCDIC, ASCII
g. Representation of Data: files, records, files
h. File organization and access
i. Security and safety of data
j. Introduction to operating systems

Unit II: MS-Windows -3 h

a. Introduction
b. Exploring the desk top
c. Running multiple programmes
d. Accessories
e. Control Panel
f. Managing documents and folders

Unit III: MS-Word -5 h

a. Starting MS-WORD
b. Creating and formatting a document
c. Changing font and point size
d. Table creation and operations

e. Auto correct, auto text, spell check, Thesaurus
f. Word Art inserting objects
g. Mail merge, letter, label, envelope
h. Page set-up, page preview
i. Printing a document

Unit IV: MS-Excel -5 h

a) Starting Excel
b) Work Sheet, Cell, Inserting Data into Rows/Columns
c) Alignment, Text-wrapping
d) Strong data, Auto sum
e) Use of functions, referencing formula cells in other formulae
f) Naming cells and ranges, Goal seek
g) Generating games
h) Integrating Worksheet data and charts with WORD
i) Creating Hyperlink to a WORD document
j) Page set-up, Print Preview, Printing Worksheets.

Unit V: MS-Power Point -5 h

a. Starting MS- Power point
b. Auto Wizard, Creating a presentation using Autocontent Wizard
c. Blank Presentation, Creating, saving and printing a presentation
d. Adding a slide to a presentation
e. Navigation through a presentation, slide sorter, Slide show, Editing slides
f. Using clipart, word Art gallery
g. Adding Transitions and Animation Effects, Setting timing for slide show, preparing note pages, preparing audiences handout, printing presentation Documents.

Unit VI :Internet -5 h

a. Genesis and use of Internet
b. Software and hardware requirements for Internet
c. Accessing the Internet, web page, using search engine, accessing the Internet from MS-Office applications

Reference Textbooks:

1. Norton, P. Introduction to computers. Tata McGraw-hill publishing company Ltd., New Delhi. 2008. 6th Edn.
2. Saxena, S. A first course in computers (based on Windows XP and office XP). Vikas publishing house Pvt. Ltd., New Delhi. 2010.

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UFNS-501 FUNCTIONAL FOODS AND NUTRACEUTICALS

Credits: 4 **Theory Hours : 60**

Course objectives:

To enable the students to:

1. Develop an understanding of the concept and classification of functional foods and nutraceuticals.
2. Appreciate of the potential health benefits of functional foods and nutraceuticals.
3. Highlight the importance of safety and efficacy of functional foods and ingredients.

Course outcomes:

The students will be able to:

1. Recognize and categorize functional foods and nutraceuticals with scientific rationale.
2. Address the prevention and treatment of important diseases using targeted health promoting functional foods and beverages.
3. Identify the methods to assess the safety and efficacy of functional foods and nutraceuticals.
4. Evaluate and understand health claims related to functional foods.

THEORY

Unit I	**Functional foods and nutraceuticals**	
	Functional foods: Definitions and types; Nutraceuticals: classification, food and non-food sources; Overview of mechanisms of action; Nutraceuticals in specific foods.	5 h
Unit II	**Phytochemicals**	
	Phytosterols, carotenoids, polyphenols, flavonoids, saponins - classification, sources, and their uses as nutraceuticals in functional foods.	12 h
Unit III	**Pre and probiotics**	
	Intestinal microflora; prebiotics and probiotics – types and criteria for selection; health benefits of prebiotics and probiotics; safety of probiotics; concept of synbiotics	6 h
Unit IV	**Carbohydrate based functional foods**	
	Oligosaccharides, dietary fiber and resistant starch: sources, types,	8 h

physiological effects and applications in functional foods.

Unit V	**Functional proteins**	
	Bioactive proteins, bioactive peptides and amino acids: sources and biological activity.	6 h
Unit VI	**Functional lipids**	
	SFA, MUFA, PUFA, CLA and structured lipids: classification, sources, and effects on health and disease.	6 h
Unit VII	**Natural health products**	
	Garlic, turmeric, soy bean, flax seed, whole grain products and ginseng- bio-active components, properties, and health benefits.	6 h
Unit VIII	**Functional foods in disease prevention**	
	Special foods for diabetes, cardiovascular diseases, cancer, immune function, bone and brain health.	6 h
Unit IX	**Safety and efficacy of functional foods and ingredients**	
	Requirements for assessment of safety and efficacy- Examples of xylitol, *Lactobacillus* strain GG, prebiotic fructo-oligosaccharides.	5 h

Reference Textbooks:

1. Wildman EC, Robert. Handbook of Nutraceuticals and Functional Foods, CRC Press, Boca Raton, Florida.2007.
2. Schmidl K Mary and Labuza P. Essentials of Functional Foods, Theodore, Aspen Publishers Inc., Maryland. 2000.

Suggested Readings:

1. Cousin PJ. Food is Medicine- The Practical Guide to Healing Foods, Duncan Baird publications, UK. 2006.
2. Meskin SM, Bidlack RW, Davies JA and Omaye TS. Phytochemicals in Nutrition and Health, CRC Press, New York. 2003.
3. Madhavi DL, Deshpande SS and Salunkhe DK . Food antioxidants- Technological, toxicological and health perspectives, Marcel Dekker, New York. 1996.

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UFNS-502 DIETETICS

Credits: 4 **Theory Hours : 60**

Course objectives:

To enable the students to:

1. Gain knowledge regarding modification of diets and nutrition support systems.
2. Identify causes and symptoms of major diseases and plan suitable therapeutic diets.
3. Understand the role of dietician.
4. Gain knowledge on diet counseling and educating patients.

Course outcomes:

The students will be able to:

1. Plan and prepare therapeutic diets for different disease conditions.
2. Develop and apply nutritional support systems in Hospital settings.
3. Elucidate the importance of dietetic discipline.
4. Undertake dietetic practice and act as diet counselors in different settings.

Unit I: Nutritional and dietary care process in health

Nutritional care of an individual depending on the state of growth & development of the individual and at various activity levels and socioeconomic status. - 2 h

Unit II: Nutritional and dietary care process in disease

Nutritional screening/ assessment and identification of nutritional problem, nutritional intervention and diet modification based on interpretation of patient data- clinical, biochemical and other relevant data, nutrition education and counseling, evaluation of nutritional care**.** - 5h

Unit III: Delivery of nutritional support- meeting nutritional needs

Enteral, tube feeding and parenteral feeding - 4h

Unit IV: Nutrition for weight management: disorders of energy balance

Obesity: Adipose tissue- regional distribution and storage, regulation of body weight, types of obesity, assessment of obesity, health risks, causes of obesity, dietary modification (past and present approach), psychology of weight reduction (psychotherapy and behavior modification, physical activity and exercise)

Underweight/excessive leanness: causes and assessment, health risks, dietary management. - 6 h

Unit V: Nutrition in fever and infectious diseases

Fever and infection, effect of fever and infection on nutritional status, nutritional management (typhoid, influenza, tuberculosis and malaria). - 4 h

Unit VI: Nutrition for gastrointestinal tract diseases

Nutritional care and diet therapy in disorders of stomach (indigestion, gastritis, gastric and duodenal ulcers), intestinal dysfunction (flatulence, constipation, diarrhoea, steatorrhea), malabsorption syndrome or diseases of small intestine, {Celiac (gluten-induced), tropical sprue, lactose intolerance} and large intestine (irritable bowel syndrome). - 12 h

Unit VII: Nutrition for diseases of the hepato-biliary tract

Nutritional care in liver diseases, dietary care and management in viral hepatitis (different types) and cirrhosis of liver, dietary care and management in diseases of the gall bladder. - 4h

Unit VIII: Nutrition for food allergies

Nutritional care in food allergy – definition, classification, manifestations – common food allergies, test for allergy, dietetic treatment. - 3h

Unit IX: Nutrition in diabetes mellitus

Etiology, classification, symptoms and diagnosis, management of diabetes mellitus, exercise, nutritional management, diet planning for Type I, Type II, physical activities, acute and long term complications. - 6h

Unit X:Nutrition in cardiovascular diseases

Hypertension- classification (secondary and essential), risk factors for hypertension, dietary management. Atherosclerosis- etiology and understanding the pathogenesis, Coronary heart disease and CHF, dietary management clinical manifestation, risk factors, dietary management and nutritional care. - 6h

Unit XI: Nutrition in renal diseases

Function of normal kidney- a brief review, classification of kidney diseases;- Glomerulonephritis- etiology, principles of dietary treatment and management, nephritic syndrome- etiology, objectives, principles of dietary treatment and management, Acute renal failure- history, general importance of protein nutrition in renal failure, causes and dietary management in chronic renal diseases; Sodium and potassium exchange list, Nephrolithiases- etiology, types of stones and nutritional care (acid and alkaline ash diet). - 6 h

Unit XII: Nutrition in cancer

Definition, classification, manifestation, tests for cancers and dietary treatment. -2h

Reference Textbooks:

1. Bhavana S. Principles and Practices of Dietetics, Common Wealth Publishers. 1999.
2. Gopalan C, Balasubramanian SC and Ramasastri BV. The Nutritive Value of Indian Foods, ICMR, New Delhi. 2014.
3. Mudambi SR and Rajagopal MV. Fundamentals of Foods, Nutrition and Diet Therapy, New Age International Publishers, New Delhi. 2007.
4. Robinson CH. Normal and therapeutic Nutrition, The Oxford and IBH Publishing Co. 1982.
5. Srilakshmi B. Dietetics, New Age International Pvt. Ltd. 2007.
6. Swaminathan M. Essentials of Food and Nutrition, Vols. I and II, Ganesh and Co., Madras. 2007.

Suggested Reading:

1. Vimla V. Advances in Diet Therapy, New Age International Ltd., Publishers. 2009.

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UFNS-503 SPORTS NUTRITION

Credits: 3 **Theory Hours : 45**

Course objectives:

To enable the students to:

1. Know the components of health and fitness.
2. Understand the principles of exercise physiology and performance.
3. Learn about nutritional and dietary requirements for sports personnel based on age, gender and type of sport.

Course outcomes:

The students will be able to:

1. Display knowledge about principles of sports nutrition.
2. Provide a comprehensive pre and post workout dietary recommendations.
3. Assess nutritional needs various sports events.
4. Suggest functional food supplements for enhancing performance.

THEORY

Unit I **Introduction: Performance and endurance nutrition**

Evolution of sports nutrition; Special nutrition for performance and physical fitness. 2 h

Unit II **Energy system for endurance and activity**

Fuels and nutrients to support physical activity; Shift in carbohydrate and fat metabolism during exercise. 4 h

Unit III **Nutritional requirements of athletes** 20h

- Sports specific requirements – short term, intermediate term and long term
- Pre-event, during the event and post-event meal requirements.
- Carbohydrate requirements; Carbohydrate loading and performance.
- Fat requirements; Role of saturated and unsaturated fat on the athletic performance.
- Protein requirements, specific amino acid needs and role of protein quality.
- Vitamin and minerals requirements, sources and functions of water

soluble vitamins, vitamin C and β- carotene and role of major (including electrolytes) and trace minerals in athletic performance.

- Water requirements; Regime of hydration and dehydration, symptoms and effects of dehydration.

Unit IV Nutrition for special needs

Weight loss and weight gain challenges for athletes; effective weight management and muscle gain in athletes. 8h

Special nutritional considerations based on gender and age.

Special nutritional needs for injured and vegetarian athletes.

Unit VI Supplements and performance enhancers

Use of protein and antioxidant supplements, Branched Chain Amino Acids (BCAA), caffeine, L- Carnitine, Coenzyme Q10, creatine, creatinine, choline and glutamine. 6h

Unit VII Functional foods in sports nutrition

Ergogenic aids: Beverages, sports drinks, energy bars, energy gels and other power boosters; Meal replacement products. 5h

Reference Textbooks:

1. Bean A. The Complete Guide to Sports Nutrition, A&C Black, London. 2001.
2. Dawn Weatherwax RD and Weiss S. Sports Nutrition, Alpha books, United States of America. 2012.
3. Ira Wolinsky (Ed.). Nutrition in exercise and sports, CRC press. 1998. 3rdEdn.
4. McArdle W, Katch F and Katch V. Exercise physiology: Energy, nutrition and human performance, 4thedn. Williams and Wilkins, Philadelphia. 1996.
5. Sizer F and Whitney E. Nutrition- Concepts and Controversies. Wadsworth Thomson Learning. 2000. 8th Edn.

Suggested Reading:

1. Whitney EN and Rolfes SR. Understanding Nutrition, West/Wadsworth, an International Thomson Publishing Co. 1999. 8thEdn.

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UFNS-504 INSTITUTIONAL FOOD MANAGEMENT

Credits: 4 **Theory Hours: 60**

Course objectives:

To enable the students to:

1. Develop knowledge base in key areas of institutional food administration.
2. Imbibe necessary expertise to function as a food service manager.
3. Start their own food service unit leading to entrepreneurship.
4. Gain practical experience in institutional food management.

Course outcomes:

The students will be able to:

1. Describe managerial responsibilities related to food service functions including menu planning, purchasing, storing, preparation, and recipe development.
2. Demonstrate essential food production and cost control skills.
3. Plan and organize a food service establishment.
4. Implement safety and sanitation measures within restaurants and food service industry.
5. Evaluate the organization and function of restaurants and food service industry.

THEORY

Unit I: Introduction to food service system

Development of food service institution approaches to management, functions and tools of management, management of resources. - 8h

Unit II: Personnel management

Concepts, manpower planning, recruitment, selection and orientation, staff training and motivation, legal aspects of personnel management. – 8 h

Unit III: Space planning and organization

Space requirement for kitchen, storage and service areas. - 7 h

Unit IV: Equipments

Types of catering equipment, selection and maintenance of equipments. - 8 h

Unit V: Food management

Characteristics of food, food purchasing, inventory management, menu planning, food production, food service, clearing, cleaning and waste management. - 12 h

Unit VI: Management of finance

Sources of finance, costing and budgeting. - 7 h

Unit VII: Hygiène and sanitation

Environmental hygiene and sanitation, personal hygiene. - 5 h

Unit VIII: Marketing of catering products

Factors affecting the marketing of the products, role of customer behavior in marketing.

- 5 h

Reference Textbooks:

1. Foskett D, Ceserani V and Kinton R. The Theory of Catering, Hodder & Stoughton. 2003, 10th Edn.
2. Kinder F, Green NR and Harris N. Meal Management. Macmillan Publishing Co,Inc, New York. 1978,6th Edn.
3. Mohini S. Institutional Food Management, New Age International Limited Publishers, New Delhi. 2004.
4. Mohini S, Surjeet M. Catering management, an integrated approach. New age international publishers. 1989, 2nd Edn.
5. Stokes JW. Food Service in Industry and Institutions, Wim C Brown Company Publishers, Dubuque, Iowa.2010. 2nd Edn.

Suggested Readings:

1. Mudambi SR and Rajagopal MV. Fundamentals of Foods, Nutrition and Diet Therapy, New Age International Publishers, New Delhi.2007.
2. Shiring SB, Jardine RW, Mills RJ. Introduction to Catering: Ingredients for Success. Cengage Learning; 2001.

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UFNS- 505 ERGONOMIC SCIENCE

Credits: 3 **Theory Hours : 45**

Course objectives:

To enable the students to:

1. Gain basic knowledge of basic human anatomy, biomechanics, physiology and kinesiology and physical ergonomics.
2. Develop aptitude in identifying the product/space design problems at home and at work, using basic design principles.
3. Understand interface of the human element and the user's perspective in the evolution of a product/designing a space.

Course outcomes:

The student will be able to:

1. Define ergonomics and apply ergonomic principles to design workplaces.
2. Use the basic knowledge of physical factors affecting human beings in relation to light, lighting, sound and noise, climate and vibrations.
3. Apply fundamental knowledge of science of human factors in ergonomics.
4. Implement work simplification techniques for reducing fatigue and enhancing performance.

THEORY

Unit I Introduction

Ergonomics- concept, significance, history and growth, principles of design and elements of design, application of ergonomics in design and work efficiency. The bio mechanisms of work as related to the user, the work space and the environment. 5 h

Unit II Components of worker input and anthropometric measurements

Components of worker input- affective, cognitive, temporal and physical :Physiological aspects of work (factor involved in muscular work, sources of energy for muscular work, energy expenditure for different activities, energy requirement for various muscular activities, endurance and muscular strength). Physiological and psychological fatigue, ways of overcoming fatigue. 10 h

Anthropometric measurements- concept and anthropometric requirements of users (normal, maximum, vertical and horizontal reaches).

Unit III Workspace

Relevance of anthropometric measurements and their application in designing workspace. Functional design and arrangement of work places, -elbow room, clearance space for operating equipments, circulation space in rooms and corridors, seating and standing work heights. Psychological effects of space. 8 h

Unit IV Work environment

Indices of indoor comfort (ventilation, lighting, color, temperature, noise), ergonomic evaluation for health and safety of user in residential space design. 6 h

Unit V Work performance

Work simplification- concept and techniques. Mundel's classes of change (Class A-changes in the product, Class B-changes in the environment, Class C-body mechanics, time and motion economy, use of time and energy saving devices). 10 h

Work simplification study: Process, operation and pathway charts.

Time management-time cost of activities, factors affecting use of time and time management tools.

Unit VI Product design

Functionalism and aesthetics, ergonomic consideration in product selection and usage (furniture, kitchen tools, surface-cooking utensils, electrical equipment). 6 h

Reference Textbooks:

1. Bridger R.S. Introduction to Ergonomics. Taylor & Francis, London. 2003.2nd Edn.
2. Gross IM and Crandall EW. Management for modern families, Appblon Century Craffs, Inc. 1972.
3. Kroemer K.H.E, Grandjean E. Fitting the Task to the Human, a Textbook of Occupational Ergonomics, Bristol, PA: Taylor & Francis. 1997. 5th Edn.
4. Nickell P and Dorsey JM. Management in Family living, John Wiley and Sons. 1976.
5. Norris B and Wilson JR. Designing Safety into Products. Taylor and Francis, London. 2001.

Suggested Readings:

1. Baiche B and Walliman N. Ernest and Peter Neufert Architect's Data, Blackwell Science. 2006. 3rd Edn.
2. Dalela S. Textbook of Work Study, Standard Publishers Distributors. 1983. 3rd Edn.
3. Steidl and Bratton. Work in the Home. John Wiley and Sons, New York. 1967.
4. Wilson JR and Covlett N. Evaluation of human work: A practical ergonomics methodology, Taylor and Francis, London. 2001.

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UFNS 506- PRACTICAL: DIETETICS and SPORTS NUTRITION

(Credits – 2)

Unit I	**Use of exchange list in planning diets**
Unit II	**Planning and preparation of diets for any three disease conditions:** **a)** Obesity and underweight **b)** Diabetes mellitus **c)** Peptic ulcer, diarrhea and constipation, **d)** Cardiovascular diseases- atherosclerosis and hypertension, **e)** Liver disorders – cirrhosis, jaundice **f)** Renal disorders – nephritis, nephrotic syndrome, renal failure, kidney stones
Unit III	Preparation of energy drinks
Unit IV	Estimation of energy value of sports foods
UNIT V	Calculation for pre-exercise meals
UNIT VI	Visit to sports center/college

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UFNS-507 PRACTICAL: INSTITUTIONAL FOOD MANAGEMENT and ERGONOMIC SCIENCE

(Credits – 1)

UNIT I	e-survey: Survey and analysis of processed and finished products and food service equipments (kitchen tools, food process tools)
UNIT II	Layout analysis of kitchens (preparing floor plans and functional arrangements – work station)
UNIT III	Planning, quality standardization and cost analysis of menus (Hospitals, packed meals and hostel mess)
UNIT IV	Energy cost of common activities
UNIT V	Time and motion study (process, pathway and videography)

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UFNS-601 FOOD PRODUCT DEVELOPMENT

Credits: 3 **Theory Hours : 45**

Course objectives:

To enable the students to:

1. Know the need and stages of food product development.
2. Comprehend different types of new food products.
3. Assess product shelf life, packaging and marketing requirement.

Course outcomes:

The students will be able to:

1. Identify and formulate new food products.
2. Determine shelf life, select appropriate packing and labelling for developed food product.
3. Compute pricing of product and provide appropriate marketing strategy.

Unit I **Food needs and consumer preferences**

Needs and types of food consumption trends. Economic, psychological, anthropological and sociological dimensions of food consumption — 4 h

Unit II **Designing new products**

Concepts and definitions. Factors to be considered for food product development (external and internal factors). — 16 h

Types of new food products: Line extensions, "me toos", new to world products, innovative-creative products, existing products-repositioned, reformulated, new form, new size and new package.

Stages of product development: conceptual stage, development stage, commercial stage.

Unit III **Shelf life and shelf life prediction**

Definition of shelf life, internal and external factors affecting shelf life of products, methods of shelf life studies- Real time and ASLT, predictive modeling (direct method), Q_{10} concept. — 8h

Unit IV **Packaging design considerations and graphics, food labeling**

Factors to be considered for package design- Facts about product, facts about market and facts about packaging materials. — 6 h

Components of food labels, nutrition labeling/nutrition facts.

Unit V Storage and transportation

Types and mode of transportation, optimization of transport taking in to account the type of product, distance and storage facilities 6 h

Unit VI Marketing of new food products

Test markets; product pricing; product positioning; promotional strategies; product launch. 5h

Reference Textbooks:

1. Bedekar SJ. Marketing Concepts and Strategies, Oxford University Press. 1991.
2. Fuller GW. New Food Product Development- From concept to marketplace. CRC Press, Taylor & Francis Inc., USA. 2005.
3. Moskowitz HR. New Directions for Product Testing and Sensory Analysis of Foods. Food and Nutrition Press, Connecticut. 1985.
4. Moskowitz, HR, Saguy I, Sam and Straus T. An Integrated Approach to New Food Product Development. CRC Press, Taylor & Francis Inc., USA. 2009.

Suggested Readings:

1. Connie M. Weaver and James R. Daniel. The Food Chemistry Laboratory – A manual for Experimental Foods, Dietetics and Food Scientists, CRC Press, New York. (Practical). 2003.
2. Lyon DH, Francombe MA, Hasdell TA and Lawson K (eds). Guidelines for Sensory Analysis in Food Product Development and Quality Control. Chapman and Hall, London. 1992.
3. Paine FA and Paine HY (eds). A Handbook of Food Packaging, 2nd Edn. Blackie Academic and Professional. 1992.

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UFNS -602 FOOD PROCESSING TECHNOLOGIES

Credits: 4 **Theory Hours: 60**

Course objectives:

To enable the students to:

1. Know the importance of food processing and the various methods used.
2. Be familiar with the technological developments in the field.
3. Understand the changes in nutritional and quality profile during processing.

Course outcomes:

The student will be able to:

1. Describe different processing methods and technology appropriate for different foods.
2. Elucidate general processing sequence for various foods.
3. Explain the impact of processing on the quality of food products.

THEORY

Unit I Cereal technology

- Review of nutritional composition of cereals. Processing of cereals - rice milling process, wheat and corn milling process. By products of rice and wheat milling- pollards, bran, hulls, rice flour, semolina, wheat malts, bulgar wheat. 12 h
- Processed cereal products-Parboiling, puffing and flaking, pasta processing.

Unit II Legume technology

- Review of nutritional value of legumes. Processing of legumes- Milling, Decortication, Puffing, Germination, and Agglomeration 12 h
- Fermentation. Byproducts utilization of legume processing.
- New improved technologies of legume processing- quick cooking legumes, canning, Instant legume powders, legume protein concentrates.

Unit III Oilseed technology

Processing of oilseeds-General methods of extraction. Special treatments for edible oilseeds. 8 h

Unit IV Fruit and vegetable technology

- Growing process, respiration and ripening. Changes occurring during ripening and senescence. Maturity and harvesting of fruits and 12 h

vegetables.

- Storage and transportation of fruits and vegetables.
- Packaging of fruits and vegetables. Fruit juice concentrates and powders.

Unit V Dairy technology

- Milk processing-Classification of milk and milk products. Separation and standardization, pasteurization, homogenization, packaging, UHT sterile milk. 12 h
- Milk products-Technology for the production of fortified milk, skimmed milk, concentrated milks, cream, butter, cheese, cultured milk products, dehydrated milk products, ice creams.
- Indigenous milk products-Technology for the production of *khoa*, channa, paneer, curd, yogurt, *ghee, kulfi.*

Unit VI Fermentation of foods 4 h

Technology for the production of - Fermented cereal foods *(idli*, *dosa* and *dhokla*); fermented vegetable products (Sauerkraut and *kimchi*); Fermented milk products (Yoghurt and cheese); Alcoholic beverages (beer and wine); Fermented soy products (Tempeh and soy sauce)

Reference Textbooks:

1. Kent NL. Technology of Cereals. Pergamon Press, New York. 1984.
2. Salunke DK. Storage, Processing and Nutritional quality of fruits and vegetables, CRC Press, Ohio. 1974.
3. Manay SN and Shadaksharaswamy M. Foods: Facts and Principles, New Age International (P) Ltd. New Delhi. 2010.
4. Subbalakshmi G and Udipi SA. Food processing and Preservation, New Age International Publishers, New Delhi. 2001.

Suggested Readings:

1. Mudambi SR and Rajagopal MV. Fundamentals of Foods and Nutrition, New Age International (P) Ltd., Publishers, New Delhi. 2008. 4th Edn.

2. Giridhari Lal. Preservation of Fruits and Vegetables, ICAR, New Delhi. 1967.

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UFNS- 603 FOOD QUALITY ASSURANCE AND EVALUATION

Credits: 4 **Theory Hours : 60**

Course objectives:

To enable the students to:

1. Understand the importance of quality assurance in food industry.
2. Learn the principles and management of quality assurance to a food production process.
3. Know different food quality systems and standards.
4. Acquire knowledge regarding food quality assessment.

Course outcomes:

The students will be able to:

1. Understand and define the concept of food quality, food safety and quality assurance.
2. Describe the laws, regulations and role of national and international standards in food quality assurance.
3. Carry out sensory evaluation of foods using subjective and objective methods.
4. Demonstrate practical knowledge about identification tests for food adulterants.

THEORY

Unit I	**Introduction to quality control and management**	
	Definition, Concepts of quality and approaches to quality management. Principles of quality control, benefits of quality control/evaluation, quality management system.	4 h
Unit II	**Quality characteristics**	
	Characteristics of quality- sensory, hidden and quantitative characteristics, methods of determining quality and factors influencing quality of food.	6 h
Unit III	**Food adulteration-** causes, types and methods to determine adulterants.	2h
Unit IV	**Food standards and statues**	8 h
	Quality standards- Indian and International standards ,Laws and regulations	

Unit V Quality assurance systems

Quality assurance systems- good agricultural practices, good manufacturing practices, good hygiene practices, hazard analysis and critical control points (HACCP), total quality systems. Identification of physical, chemical and biological hazards	10 h

Unit VI Food quality evaluation: basic concepts

Physiological basis of sensory evaluation, sensory characteristics of food, sensory panels, environment for sensory evaluation, sample preparation and presentation.	6 h

Unit VI1 Sensory evaluation of food quality

Types of tests (descriptive, preference and difference testing), preference, acceptability and score cards.	12 h

Unit VIII Objective evaluation of food quality

General guidelines, physical methods (volume, specific gravity, moisture, texture, viscosity and rheology, color, cell structure), and chemical methods (nutrient analysis, pH, sugar concentration, saltiness, flavor, proximate analysis).	12 h

Reference Textbooks:

1. Mahindru SN. Food Science and Technology, Vol. II, APH Publishing Corporation, New Delhi. 2009.
2. Prem Kumar Jaiswal. Food Quality and Safety, CBS Publishers and Distributors Pvt. Ltd., Noida, U.P. 2009.
3. Winton L. Andrew and Winton B Kate. Techniques of Food Analysis. Allied Scientific Publishers, New Delhi. 1999.
4. Mehta, Rajesh and George J. Food Safety Regulations, Concerns and Trade, McMillan India Ltd. 2005.
5. Jacob and Micheal. Safe Food Handling: A training guide for managers of food service establishments, WHO. 1989.
6. Margaret McWilliams. Foods Experimental Perspectives, Prentice Hall, New Jersey. 1993.
7. Dev Raj, Rakesh Sharma and Joshi VK. Quality Control for Value Addition In Food Processing, New India Publishing Agency, New Delhi. 2011.

Suggested Reading:

1. Hubbard R Merton. Statistical Quality Control for the Food Industry, Plenum Publishers, New York. 2003.

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UFNS-604 COMMUNITY NUTRITION

Credits: 4 **Theory Hours : 60**

Course objectives:

To enable the students to:

1. Identify major factors, challenges, and trends that influence nutrition status in developing countries.
2. Learn major concepts in assessment of nutritional status.
3. Design nutritional interventions and education programs.
4. Know about various national and international nutritional intervention programs.
5. Ascertain potential nutritional problems and resources available to promote and protect nutrition status of women and infants, children, and the elderly populations.

Course outcomes:

The students will be able to:

1. Collect, analyze and review data regarding nutrition problems in communities.
2. Perform anthropometric measurements and calculate nutritional indices.
3. Conduct dietary surveys and assess nutritional status.
4. Demonstrate skills in preparation of audio-visual aids for nutrition education.
5. Interpret nutrition information for the public.
6. Participate in service oriented projects.

THEORY

Unit I **Concepts and scope of community nutrition** 4 h

Unit II **Nutritional problems of the community**

Common problems in India, causes (nutritional & non–nutritional), incidence of nutritional problems, signs and symptoms, treatment – PEM, micronutrient deficiencies (vit–A, Iron, Iodine), Fluorosis and hypervitaminosis. 6 h

Unit III **Schemes, programmes and organizations for combating nutritional problems**

a) National feeding programmes: Course Objectives and operation, applied nutrition programmes, ICDS, Special nutrition programmes, mid–day meal programme and any other group feeding programmes in the state. 6 h

b) International organizations concerned with food, nutrition & health Food and Agriculture organization, WHO, UNICEF, CARE, Nutrition rehabilitation centers. 6h

Unit IV	**Nutrition education : concept, importance and approaches**	8 h
Unit V	**Nutritional status assessment**	
	a) Clinical signs: Need and importance, identifying signs of PEM, vitamin A deficiency and iodine deficiency. Interpretation of descriptive list of clinical signs.	5 h
	b) Anthropometry : Need and importance, standards for reference, techniques of measuring height, weight, head, chest and arm circumference, interpretation of these measurements and use of growth charts.	4 h
	c) Diet surveys: Need and importance, methods of dietary survey. Interpretation – concept of consumption unit, intra and inter individual distribution in family. Adequacy of diet with respect to RDS, concept of family food security. -	3 h
	d) Biochemical & biophysical tests	4 h
	e) Rapid Assessment Procedures: Need and importance, technique, interpretation.	6 h
Unit VI	**Surveillance systems: International, National, regional and community**	8 h

Reference Textbooks:

1. Bandila KR. Food Problems in India, Ashish publishing house. New Delhi. 1992.
2. Frankle RT and Owen AL. Nutrition in the community: The art of delivering services, Mosby. 1993.
3. Gibney MJ, Magaretts BM, Kearney JM and Lenore Arab. Public Health Nutrition, Blackwell Publishing Co., U.K. 2004.
4. Owen AL, Splett PL and Owen GM. Nutrition in the Community, WCB McGraw-Hill. 1999.
5. Sabarwal, B. Public Health and Nutritional Care. Common Wealth Publishers. New Delhi. 1999.
6. Swaminathan M. Essentials of Food and Nutrition, Vols. II, Ganesh and Co., Madras. 2007.

Suggested Readings:

1. Devadas RP and Radharukmini. The School Lunch Programme, Ministry of Education. 1964.
2. FAO. Annual report on Food and Nutrition Policy. 1970.

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UFNS-605 NUTRITION IN EMERGENCIES AND DISASTERS

Credits: 3 **Theory Hours : 45**

Course objectives:

To enable the students to:

1. Familiarize with various natural and manmade emergencies and disasters having an impact on nutrition and health status.
2. Understand the special nutritional concerns arising out of these situations.
3. Learn strategies for nutritional rehabilitation management of the health of emergency affected populations.
4. Be acquainted with emergency preparedness and response programs.

Course outcomes:

The students will be able to:

1. Identify various forms of malnutrition and micronutrient deficiencies that occur during emergencies.
2. Conduct nutritional surveillance in emergency conditions.
3. Devise nutritional relief and rehabilitation strategies during emergencies and disasters.

THEORY

Unit I	**Natural/Manmade disasters resulting in emergency situation** Famine, drought, flood, earthquake, cyclone, war, civil and political emergencies. Factors giving rise to emergency situation in these disasters. Illustration using case studies from Indian subcontinent.	5 h
Unit II	**Nutritional problems in emergencies in vulnerable groups** Causes of malnutrition in emergency situations. Major deficiency diseases in emergencies. Protein – energy malnutrition. Specific micronutrient deficiencies- iron, iodine, vitamin A, vitamin B_1, niacin, vitamin D, etc.	10 h
Unit III	**Communicable diseases : surveillance and treatment** Control of communicable disease in emergencies – Role of immunization and sanitation, prevention and treatment of specific diseases- viral hepatitis, malaria, acute respiratory infections, measles, meningitis, tuberculosis, typhoid fever, scabies, worm infections, HIV/AIDS.	6 h
Unit IV	**Assessment and surveillance of nutritional status in emergency affected populations**	

	Scope of assessment of malnutrition in emergencies. Indicators of malnutrition. Clinical signs for screening acute malnutrition. Anthropometric assessment of nutritional status. Indicators and cut–offs indicating seriously abnormal nutrition situation: Weight-for-height based indices, MUAC, social indicators. Organization of nutritional surveillance and individual screening.	6 h
Unit V	**Nutritional relief and rehabilitation** Assessment of food needs in emergency situations. Food distribution strategy – identifying and reaching the vulnerable group – Targeting Food Aid. Mass and supplementary feeding. Therapeutic Feeding. Special foods/ rations for nutritional relief: cereal pulse dehydrated foods and beverages, and RTE forms. Local foods in rehabilitation. Organization of mass feeding/general food distribution. Feeding centre, transportation and food storage, sanitation and hygiene, evaluation of feeding programmes and household food security and nutrition in emergencies.	12 h
Unit VI	**Public nutrition approach to tackle nutritional problems in emergencies.**	2 h
Unit VII	**Emergency preparedness and response programmes** Community and national preparedness, coordination, operations (fostering ownership, participation and capacities, displacement of population, optimizing the food aid, psychosocial and mental health concerns, facilitating rehabilitation), administration of distribution centers and camps.	4 h

Reference Textbooks:

1. WHO. The management of nutrition in major emergencies, World Health Organization, Geneva. 2000.
2. FAO. FAO's Emergency Activities, Rome. 1997.
3. MSF. Refugee Health: An Approach to Emergency Situations, London: MacMillan for MSF. 1997.
4. Swaminathan M. Essentials of Food and Nutrition, Vols. II, Ganesh and Co., Madras. 2010.
5. WFP. World Food Programme. Food and Nutrition Handbook Draft, Rome. 1999.
6. WFP/ UNHCR. Guidelines for selective feeding programmes in emergency situations, Rome and Geneva: WFP and UNHCR. 1988.

Suggested Readings:

1. WHO. Applied Health Research Priorities in Complex Emergencies, Geneva. 1997.
2. USCR. World Refugee Survey, Washington. 1999.

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UFNS-607 PRACTICAL: FOOD PRODUCT DEVELOPMENT FOOD PROCESSING TECHNOLOGIES and FOOD QUALITY ASSURANCE AND EVALUATION

(Credits -2)

UNIT I Detection of adulterants in food samples

UNIT II

- Preparation of score card and learning methods of sample preparation and presentation for conducting recognition, threshold, hedonic rating and difference tests
- Conducting objective evaluation of foods for Appearance and cell structure (ink print),Volume (volumeter),Consistency (Line spread test, Acidity(pH meter)

UNIT III

- Standardization of one new food product and conducting appropriate sensory evaluation
- Estimating cost and market price, storage and transportation considerations
- Identifying appropriate packaging and labeling for the new product

UNIT IV Processing of cereal, legume, fruit and vegetable, milk based and fermented food products

UNIT V Assessment of physico-chemical characteristics of wheat, rice, legumes, milk, and oils.

UFNS-608 PRACTICAL: COMMUNITY NUTRITION

(Credits-1)

Unit I **Assessment of community nutritional status**

a) Anthropometry
b) Clinical assessment
c) Diet surveys

Unit II **Nutrition education**

a) Preparation of Nutrition Education aids
b) Nutrition Education through computers.
c) Assessment of knowledge, attitude and practices.

Unit III: Evaluation of local nutrition centers

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