

THIRUVALLUVAR UNIVERSITY
BACHELOR OF SCIENCE
M.Sc. FOODS AND NUTRITION
DEGREE COURSE
CBCS PATTERN
(With effect from 2017-2018)

The Course of Study and the Scheme of Examinations

S. NO	Study Components		Ins. hrs/ Week	Credit	Title of the paper	Maximum Marks		
	Course Title							
SEMESTER I						CIA	Uni. Exam	Marks
1	MAIN	Paper-1	6	5	Advanced Physiology	25	75	100
2	MAIN	Paper-2	7	5	Advanced Food Science	25	75	100
3	MAIN	Paper-3	6	5	Essentials of Macro Nutrients	25	75	100
3	MAIN PRACTICAL	-	6	0	Advanced Food Science & Essentials of Macro Nutrients	0	0	0
4	ELECTIVE I	Paper-1	5	3	Health and Fitness	25	75	100
			30	18		100	300	400
SEMESTER II						CIA	Uni. Exam	Marks
5	MAIN	Paper-4	6	5	Essentials of Micro Nutrients	25	75	100

M.Sc. Foods and Nutrition: Syllabus (CBCS)

6	MAIN	Paper-5	5	5	Nutrition Through Life Cycle	25	75	100
7	MAIN	Paper-6	5	5	Food Microbiology	25	75	100
8	MAIN PRACTICAL	Paper-1	0	4	Advanced Food Science & Essentials of Macro Nutrients	25	75	100
9	MAIN PRACTICAL	Paper-2	6	4	Essentials of Micro Nutrients & Nutrition Through Life Cycle	25	75	100
10	ELECTIVE II	Paper-2	5	3	Food Standards and Quality Control	25	75	100
11	Compulsory Paper		3	2	Human Rights	25	75	100
			30	28		175	525	700
SEMESTER III						CIA	Uni. Exam	Marks
13	MAIN	Paper-7	5	4	Nutritional Biochemistry	25	75	100
14	MAIN	Paper-8	5	4	Research Methodology and Applied Statistics	25	75	100
15	MAIN	Paper-9	4	4	Community Nutrition	25	75	100
16	MAIN PRACTICAL	-	6	0	Nutritional Biochemistry & Community Nutrition	0	0	0
17	ELECTIVE III	Paper-3	5	3	Nutrition in Emergencies	25	75	100
18	ELECTIVE IV	Paper-4	5	3	Functional foods and Nutraceuticals	25	75	100
19	Viva Voce		-	2	Internship	25	75	100
			30	20		150	450	600

M.Sc. Foods and Nutrition: Syllabus (CBCS)

SEMESTER IV						CIA	Uni. Exam	Marks
20	MAIN	Paper-10	7	5	Diet Therapy	25	75	100
21	MAIN PRACTICAL	Paper-3	0	4	Nutritional Biochemistry & Community Nutrition	25	75	100
22	MAIN PRACTICAL	Paper-4	6	4	Diet Therapy	25	75	100
23	MAIN	Project / Dissertation	12	8	Core Project/ Dissertation with viva voce	25	75	100
24	Elective V	Paper-5	5	3	Food biotechnology	25	75	100
			30	24		125	375	500

Subject	Papers	Credit	Total Credits	Marks	Total marks
MAIN	10	4-5	47	100	1000
MAIN PRACTICAL	4	4	16	100	400
INTERNSHIP	1	2	2	100	100
DISSERTATION	1	8	10	100	100
ELECTIVE	5	3	15	100	500
COMPULSORY PAPER	1	2	2	100	100
Total	21		90		2100

THIRUVALLUVAR UNIVERSITY
M.Sc. FOODS AND NUTRITION
SYLLABUS
UNDER CBCS
(with effect from 2017-2018)

SEMESTER I
PAPER - 1
ADVANCED PHYSIOLOGY

OBJECTIVES

To enable the Students to :

To understand the general structure and functions of various systems and organs in the body.

To understand the abnormal changes in tissues and organs in diseased condition.

UNIT-I

Cellular basis of Physiology - Body fluid compartment, membrane potential, Inter cellular communication - Homeostasis.

Biochemical aspects of muscle tissue - structure, chemical composition, mechanism and energetics of muscle contraction, muscle fatigue.

Biochemical aspects of nerve tissue - structure, composition & functions of nerve tissue.

UNIT-II

Endocrinology and Reproduction

Anatomy of endocrine glands and Reproductive organs. Hormones - Mode of action, functions of hormones of the endocrine glands - Pituitary, Adrenal, Thyroid, Gonadal hormones, Pancreas, Pineal body and Parathyroid, Hypo and Hyperfunctions of the glands.

UNIT-III

Respiration and Gastro - Intestinal

Oxygen requirement for nutrients, composition of inspired and expired gas, partial pressure of gas, diffusion gradient and gas flow, transport of oxygen and CO₂, Hemoglobin affinity for O₂ and dissociation. Anatomy and function of Gastrointestinal Tract, movement of intestine. Mechanism of secretion of gastric juice.

Hunger, Appetite, Satiety - physiological and psychological factors affecting food intake, circadian rhythm in GI tract secretions.

UNIT-IV

Circulation and Excretion

Blood - composition, functions of formed elements of blood and plasma proteins, origin and conduction of heart beat, ECG-interpretation, Latest development in cardiac condition, cardio vascular mechanism and homeostasis.

Excretion - formation of urine, characteristics of urine, normal and abnormal constituents of urine, acid - base balance.

UNIT-V

Nervous system – Structure and functions of brain (briefly) and spinal cord; structure and functions of neuron; conduction of neuro impulse, role of neuro transmitters; blood brain barriers, CSF, hypothalamus and its role in various body functions.

Immunity - Properties, natural and acquired Immunity, features of immune responses, antigen - antibodies - types, properties, antigen - antibody interaction, Auto immune disorder and allergy.

REFERENCES:

1. Guyton, A.G. and Hall, J.B. (2005): Text Book of Medical Physiology, 9th Edition, W.B. Sanders Company, Prism Books (Pvt.) Ltd., Bangalore.
2. Wilson, K.J.W and Waugh, A. (2003): Ross and Wilson Anatomy and Physiology in Health and Illness 8th Edition, Churchill Livingstone.
3. Jain, A.K.: Textbook of Physiology. Vol.I and II. Avichal Publishing Co., New Delhi.
4. McArdle, W.D., Katch, F.I. and Katch V.L(2001): Exercise Physiology. Energy, Nutrition and Human Performance, 4th Edition, Williams and Wilkins, Baltimore.

PAPER – 2
ADVANCED FOOD SCIENCE

OBJECTIVES

To enable the Students to

- Understand the principles of cooking
- Learn the composition of various foods.
- Study the effects of cooking on composition

UNIT-I

Food Groups

Cereals - Rice & wheat and other Millets - Composition and Nutritive Value.

Starch - Sources, Characteristics, Principles of Starch cookery.

Batter and Dough - Structure, Principle, Properties, Different types of flour, Gluten - properties, Gluten formation, Dextrinisation, Gelatinisation and Retrogradation.

Flour - Types, properties. Bread - yeast leavened, Quick bread, pastries. - Role of ingredients & preparation.

UNIT-II

Pulses - Composition, types, Cooking methods, factors affecting cooking quality, nutritive value, toxic constituents and its removal, Germination and factors affecting Germination .

Vegetables - Structure, Classification, Composition, Nutritive value, Methods of Cooking, Changes on Cooking - pigments.

Fruits - Structure, Classification, Composition, Ripening of fruits, changes on ripening, Pectic substances, Cooking changes.

UNIT-III

Egg - Structure, Composition, Nutritive value, Grading, Methods of Cooking and Role of egg in cookery.

Meat - Structure, Composition, Nutritive value, Classes and Grades of meat cuts, Changes on cooking and Rigor mortis. Poultry - Composition, Nutritive value, Grades, Methods of cooking, Effects of cooking.

Fish - Composition, Nutritive value, Types, Cuts, Selection, Spoilage, Cooking and Factors effecting cooking quality.

UNIT-IV

Milk and Milk Products - Composition, Nutritive value, Constituents, Properties of milk, Effects of acid, Salt, Heat on milk proteins and coagulation. Milk products - Ice cream, Types, Crystal formation and Dairy forms.

Fats & Oils - Types properties of fat relating to cooking, Rancidity, Tests for rancidity, Hydrogenation, Changes in fat during heating, Factors affecting fat absorption, Shortening, Use of fat in tenderness of cooked products.

UNIT-V

Sugar cookery - Types of sugar, Properties, Crystallization, Stages in Sugar cookery, Application in Indian recipes.

Beverages - Classification, Nutritive value, Preparation of milk based beverages.

Spices and Condiments - Use of spices and condiments in Indian cookery.

REFERENCES

1. Charley, H. (1982): Food Science (2nd edition), John Wiley & Sons, New York.
2. Potter, N. and Hotchkiss, J.H. (1996): Food Science, Fifth edition, CBS Publishers and Distributors, New Delhi.
3. Belitz, H.D. and Grosch, W. (1999): Food Chemistry, (2nd edition), Springer, New York.
4. Abers, R.J. (Ed) (1976): Foams, Academic Press, New York.
5. Cherry, J.P. (Ed) (1981): Protein Functionality in Foods, American Chemical Society, Washington, D.C.
6. SriLakshmi, B. Food Science, New Age International [p] Limited, New Delhi, Third Edition, 2003
7. Potter, N.W., Food Science, AVI Publishing Co. Cunneticut, 1960.
8. Shakuntalamanay, N& Shadaksharaswamy, M, Foods, facts and principles, Wiley Eastern Ltd. 2004.
9. Christian, E.W. Essentials of Food Science, XXIV edition, WWW.Springer.com/978-1-4614-9137-8. 2014.

PAPER – 3

ESSENTIALS OF MACRO NUTRIENTS

OBJECTIVES

To enable the students to

- Understand the role of macronutrients.
- The metabolism of macronutrients.

UNIT-I : CARBOHYDRATES

Classification, sources, functions, digestion, absorption, utilization and storage, hormonal regulation of blood glucose, role of carbohydrate in dental caries.

Dietary fibre - Development and concept, role of fibre in lipid metabolism, colon function, blood glucose level and GI tract functions - Disadvantages of Dietary fibre.

UNIT-II : LIPIDS

Classification, sources, functions, digestion, absorption, utilization and storage, effects of deficiency and excess of fat, lipotropic factors, role of saturated fat, cholesterol, lipoprotein and triglycerides and EFA in the diet.

UNIT-III : PROTEINS AND AMINOACIDS

Classification, sources, functions, digestion, absorption, utilization and storage, protein quality evaluation, nutritional classification of aminoacids, aminoacid balance, imbalance and toxicity, aminoacid pool.

UNIT-IV : ENERGY

Energy value of foods, SDA, energy production, factors affecting thermogenesis, energy utilization by cells, energy output - BMR, physical activity, factors affecting energy input - hunger, appetite, energy balance, measurement of energy content of food.

UNIT-V

Inter relationship between carbohydrate, fat and protein, nutritional adaptation and hypotheses.

REFERENCES:

1. Shills, M.E., Olson, J., Shike, M. and Roos, C (2003). Modern Nutrition in Health and Disease, 9th edition Williams and Williams. A Beverly Co. London.
2. Bodwell, C.E.. and Erdman, J.W. (2008) Nutrient Interactions. Marcel Dekker Inc. New York
3. Sareen, S, James, J (2005). Advanced Nutrition in Human Metabolism, 4th Edition, Thomson Wordsworth Publication, USA.

4. Chandra, R.K. (eds) (2002): Nutrition and Immunology, ARTS Biomedical. St. John's Newfoundland.

Journals:

1. Nutrition Reviews
2. Journal of Nutrition
3. American Journal of Clinical Nutrition
4. British Journal of Nutrition
5. European Journal of Clinical Nutrition
6. International Journal of Vitamin and Nutrition Research
7. International Journal of Food Science and Nutrition
8. Nutrition Research
9. Ann Nutr Metab

ELECTIVE

PAPER – 1

HEALTH AND FITNESS

UNIT-I

Definition of Health and wellness - Factors affecting health and wellness. Physiological, psychological and social health.

UNIT-II

Fitness - Definition, basic components of physically active life style in preventing obesity, osteoporosis, heart disease, and diabetes, Physical fitness tests - for flexibility, muscle endurance (any 3 tests for each) and cardio vascular endurance.

UNIT-III

Nutrition and exercise - energy requirement for, aerobic and anaerobic exercises, carbohydrate loading, water and dehydration, special foods. Importance of exercise in preventing life style diseases - Diabetes, CVD, hypertension, obesity and osteoporosis.

UNIT-IV

Nutrition in sports – Sports specific requirements diet manipulation pre game and post game means, Use of different nutrigenic aids and commercial supplements. Sports drinks, Diets for persons with high energy requirements stress, fracture and injury.

UNIT-V

Awareness about the alternative systems for health and fitness- Ayurveda, yoga, meditation, vegetarianism and traditional diets. Special nutritional needs for monitoring, space, military and sea voyage.

REFERENCES

1. Mahan, L.K. & Ecott-Stump, S. (2000): Krause's Food, Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
- 2.Sizer, F & Whitney, E. (2000): Nutrition – Concepts and Controversies, 8th Edition, Wadsworth Thomson Learning.
3. Whitney, E.N. & Rolfes, S.R. (2003): Understanding Nutrition, 8th Edition, WestWadsworth, An International Thomson Publishing Co.
4. Ira Wolinsky (Ed) (2003): Nutrition in Exercise and Sports, 3rd Edition, CRC Press
5. Parizkova, J. Nutrition, physical activity and health in early life, Ed. Wolinsky, I. CRC Pres

SEMESTER II

PAPER – 4

ESSENTIALS OF MICRO NUTRIENTS

OBJECTIVES:

To enable students to :

Gain a deeper understanding of principles of nutrition.

Develop competence to carry out investigations in nutrition.

UNIT-I : HOMEOSTASIS MAINTENANCE

Homeostasis-Definition, Concepts and mechanism.

Electrolytes - Electrolyte content of fluid compartments, Functions of electrolyte, Sodium, Potassium and Chloride, Absorption, Transport and Electrolyte Imbalance, Factors affecting electrolyte balance, Maintaining electrolytes, hydrogen ion balance, Water balance.

UNIT-II : FAT SOLUBLE VITAMINS

Vitamins A,D,E,K - Functions, Physiological action, Digestion, Absorption, Utilization, Transport, Storage, Excretion, Source, RDA, Deficiency, Diagnosis of deficiency, Toxicity, Interaction of fat soluble vitamins with other nutrients. Hypo and hyper vitaminosis.

UNIT-III : WATER SOLUBLE VITAMINS

Thiamine, Riboflavin, B₁₂, Folic acid, Pyridoxine, Pantothenic acid, Niacin, Biotin, Ascorbic acid - Functions, Physiological action, Digestion, Absorption, Utilization, Transport, Storage, Excretion, Source, RDA, Deficiency, Diagnosis of deficiency, Toxicity, Interaction of fat soluble vitamins with other nutrients.

UNIT-IV : MACROMINERALS

Calcium - Distribution in the body digestion, Absorption, Utilization, Transport, Excretion, Balance, Deficiency, Toxicity, Sources, RDA, Regulation of calcium concentration, Calcium interaction with other nutrients.

Phosphorus - Distribution, Concentration in the body, Digestion, Absorption, Utilization, Transport, Storage, Excretion, Sources, Calcium: Phosphorus ratio.

Iron - Distribution, Concentration in the body, Digestion, Absorption, Utilization, Transport, Storage, Excretion, Sources, RDA, interaction with other nutrients, Role of iron in prevention of anaemia.

UNIT-V : MICRO MINERALS

Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, Chromium, Distribution in the human body, Physiology, Function, deficiency, Toxicity and Sources.

REFERENCES:

1. Swaminathan, M. Advanced Textbook on Food Science and Nutrition, Vol:2, Second edition, Reprinted, Bangalore Printing and publishing Co Inc, Bangalore, 2012.
2. Gopalan, C Ramasastry, B.V. and Balasubramanian, S. Nutritive Value of Indian Foods, National Institute of Nutrition, Hyderabad, 2012
3. Swaminathan, M. Essentials of Foods and Nutrition, Volume I and II Ganesh and Co., Madras, 2013.
4. Mahan, Kathleen L. Krause's Food, Nutrition and Diet Therapy, W.B.Saunders's, 11th Edition 2010
5. Srilakshmi. E. Nutrition Science, New Age International Publishers, 2013.
6. Recommended dietary intakes for Indian – Indian Council of Medical Research, New Delhi, 2012.

Journals:

1. American Journal of Clinical Nutrition, The American Society for Clinical Nutrition, Inc., USA.
2. Annual Reports , National Institute of Nutrition, Hyderabad.
3. British Journal of Nutrition, Cambridge University Press, London.
4. Indian Journal of Medical Research, Indian Council of Medical Research, New Delhi.

PAPER – 5

NUTRITION THROUGH LIFE CYCLE

OBJECTIVES:

- To know the computation of allowances.
- To impart knowledge on the importance of nutrition during life span.
- To enlighten on the dietary modifications.

UNIT-I

Recommended allowances - RDA for Indians, basis for requirement, computation of allowance based on energy expenditure, components of energy expenditure. General concepts about growth and development through different stages of life.

UNIT-II

Nutrition in Pregnancy

Stages of gestation, maternal weight gain, complications of pregnancy, maternal physiological adjustments, nutritional problems and dietary management, importance of nutrition during and prior to pregnancy, teenage pregnancy - nutritional problems and dietary management, planning a menu.

UNIT-III

Nutrition during Lactation

Physiology of lactation, hormonal control and reflex action, efficiency of milk production, problems of breast feeding, nutritional composition of breast milk, nutritional concerns during lactation, special foods during lactation, dietary modification, planning a menu.

Nutrition in Infancy

Infant feeding, nutritional needs, premature infant and their feeding, weaning foods.

Feeding problems, infant formulae lactose intolerance, planning menu.

Nutrition in Pre-school - Physiological development related to nutrition, feeding problems, behavioural characteristics, nutritional requirement and planning diet.

UNIT-IV

Nutrition in school children - feeding school children and factors to be considered. Planning a menu, feeding problems, packed lunch.

Nutrition during Adolescence - changes in growth and development, hormonal influences, Age at menarche - factors affecting age at menarche, psychological problems, body image, disordered eating behaviour, nutritional problems, planning a menu.

UNIT-V

Nutrition in Adult and Elderly

Nutrition and work efficiency, Premenstrual Syndrome, Menopausal and Post-Menopausal women, hormonal changes, nutritional requirement, planning a menu.

Physiological changes in aging - Psycho-social and economic factors affecting eating behaviour, social situation, knowledge and belief, institutionalization, common health problems, nutritional requirement, modification in diet, feeding old people.

REFERENCES:

1. Swaminathan, M. Advanced text book on Food and Nutrition, , Anmol Publication Pvt, Ltd, Second Edition. 2004.
2. Gopal, C. Kamal Krishnaswamy, Nutrition in Major Metabolic Disease, Oxford India Paper backs Publisher First Edition 2000.
3. H.P.S. Sachdev, Anna Choudhry., Nutrition in children- Developing country concerns N.I. Publications Pvt. Ltd, New Delhi, 2004.
4. Srilakshmi, B. Nutrition Science, New Age International [p] ltd, New Delhi, 2002.
5. Bahasahe and B. Dosa, Hand book of nutrition and diet.
6. Venkataiah S.D., Nutrition Education, Anmol Publication Pvt. Ltd, Revised 2004.
7. Mahtab S. Bamji, Prasad Rao, N. Vinodini Reddy. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt. Ltd, Second Edition, 2003.
8. Sumati. R. Mudambi, M.V Rajagopal., Fundamentals of Foods & Nutrition, 4th Edition New age International publishers New Delhi, 2006.
9. Melvin H. Williams., Nutrition for health fitness & Sport. 5th edition Mcgraw –Hill, publishing Co., 1999.
10. Judith E. Brown., Nutrition Now, 2nd edition, West / Wadsworth west / Wadsworth, An International Thomson publishing company, 1998.

PAPER – 6
FOOD MICROBIOLOGY

OBJECTIVES:

To enable the students to :

Learn about the morphology of different microorganisms.

Study the food spoilage caused by microorganism

Understand the various types of poisoning and infection caused by microorganism.

UNIT-I

Types and Classification of microorganism, and important micro-organisms in foods, morphology of yeast, mould, bacteria, virus, algae and protozoa.

UNIT-II

Micro-organisms and food: Their primary sources in foods, cultural characteristics and biochemical activities. Airborne bacteria, fungi Microorganisms found in soil Normal flora of skin, nose, throat, GI tract

UNIT-III

Food in relation to disease - food born diseases, food infection, intoxication, microbial toxins - types, bacterial poisoning and infection - causative agents and sources , symptoms and prevention of Staphylococcal food poisoning, botulism, salmonella, bacillus infection, E.coli, food poisoning of fungal origin - ergotism, aflatoxin.

UNIT-IV

Control of microorganism - Principles of preservation, General principles underlying spoilage of foods. Preservation by high and low temperature, chemical preservatives, salt, sugar as preservative, new trends in preservation.

UNIT-V

Sterilization by Physical agents - Heat, moist heat, fractional sterilization, pasteurization, other types of sterilization, chemical sterilization. Microbiology of water, typical organisms in water, types of bacterial examination for water, water treatment.

REFERENCES:

1. Pelczar, M.I and Reid, R.D, Microbiology, MC Graw Hill Book Company, New York,5th edition, 1993.
2. Atlas M.Ronalds , Principles of microbiology, 1st edition, Mosby – year book Inc, Missouri, U.S.A, 1995.
3. Frazier, W.C, Food Microbiology, MC Graw Hill Inc 4th edition, 1988.
4. Banwart , Basic Food Microbiology, 2nd edition CBS Publisher, 1989.
5. Bensaon, H.J, Microbiological applications, C. Brown publishers, U.S.A, 1990.

CORE PRACTICAL I
ADVANCED FOOD SCIENCE

1. Cereal cookery - Preparation of rice based products - Idli, Dosai, Appam to study the effect of fermentation and soaking.
2. Preparation of wheat based products - Chappathi, phulkas, poories - with different proportion of wheat flour - study the development of gluten.
3. Pulse cookery - Effects of soaking, acid , alkali and sprouting and different methods of cooking on cooking time and quality of pulses.
4. Vegetable cookery - Effect of acid, alkali and methods of cooking on pigments.
5. Egg, meat, fish, poultry - Methods of cooking on acceptability of the various fleshy foods, foam formation and factors affecting foam formation. Special effect on colour and tenderness.
6. Fats and oils - Smoking point of different fats and oils - Determination of best frying temperature for different oils, factors affecting fat absorption.
7. Sugar cookery - Stages of sugar cookery, use of sugar in Indian recipes. Crystallization and factors affecting crystallization.

ESSENTIALS OF MACRO NUTRIENTS

(Processed and unprocessed sample)

1. Qualitative analysis - Reaction of pentoses, hexoses, Dextrin, starch, glycogen.
2. Quantitative analysis
3. Estimation of fat by Soxhlet method
4. Estimation of Total protein by Microkjeldhal method
5. Extraction of lipids from egg yolk

CORE PRACTICAL – II
ESSENTIALS OF MICRO NUTRIENTS

1. Ashing of food and preparation of ash solution.
2. Estimation of calcium in food.
3. Estimation of phosphorus in food.
4. Estimation of iron in food.
5. Estimation of ascorbic acid in cabbage by dye method.
6. Estimation of thiamine in food by fluorimetry.

NUTRITION THROUGH LIFE CYCLE

1. Menu planning, Preparation and Presentation for the following
2. Pregnancy
3. Lactation
4. Infants
5. Pre-schoolers
6. School going children
7. Adolescence
8. Adult of different working category
9. Old people
10. Menu of different variation - age specific, income specific and condition specific.
11. Menu of different variation under each:
12. Age category mentioned above
13. Weight (underweight, obesity).
14. Any special condition.
15. Based on type of work.
16. Menu planning for sports persons
17. Menu planning for Mountaineering, sea voyage and space travel.

ELECTIVE

PAPER – 2

FOOD STANDARDS AND QUALITY CONTROL

OBJECTIVES:

To enable the students to :

Be aware of fundamental food quality control procedures.

Aware of common food standards

Know about food laws.

UNIT-I

Principles of quality control – Objectives, principles, importances, functions of quality control Raw material process control and Product inspection.

Food adulteration and hygiene - definition, Common adulterants in different foods, method of detecting adulterated foods.

UNIT-II

Food additives - Definitions, Types, Action.

Leavening agents - Definitions, Classifications.

Colour of foods - Natural colours, certified artificial colours, Non-certified colors, Use and Optimum levels. Enzymes of importance in food processing - Carbohydrates, Proteases, lipases, oxidoreductases, hydrolases.

UNIT-III

Natural Toxins in Food: Natural toxins of importance in food- Toxins of plant and animal origin; Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Natural occurrence, toxicity and significance. Food poisoning; Mycotoxicoses of significance. Determination of toxicants in foods and their management.

UNIT-IV

Food laws and standards. Hazard analysis and critical control point(HACCP) Good manufacturing practices (GMP) Good hygiene practices (GHP) International organization for standardization (ISO) Essential commodities act, codex Alimentarius, World Trade organisation (WTO) , Technical barrier of Trades (TBT), sanitary phyto sanitary(SPS) rules, Bureau of Indian standards(BIS), Agmark , Food Safety Standards Act 2006 (FSSA), Prevention of Food Adulteration Act (PFA), Milks and Milk products order (MMPO), Meat Product Order (MFPO), Fruit Product Order (FPO).

Standards for foods - Milk and milk products, Fruits and Vegetables, Beverages and Fleshy foods.

UNIT-V :

FOOD SAFETY AND HYGIENE

Meaning for food safety, Importance of food quality and safety in developing countries, Factors affecting food safety, Current food safety regulations. **HACCP-definition, principles, and affiliations(SS)**, consumer education, food safety education and training, food sampling and analysis of food

REFERENCES:

1. Adam Tamime, Probiotic Dairy products, Blackwell Publishing, USA, 2005.
2. Curricula On Food Safety, Directorate of General of health Services, Ministry of health &family Welfare, Govt of India, New Delhi, 2003.
3. David A.Shapton, Naroh F, Shapton ,Priciples and practices for the safe processing of foods, Heineman ltd, Oxford,1991

SEMESTER III

PAPER – 7

NUTRITIONAL BIOCHEMISTRY

OBJECTIVES:

To enable the students to :

Understand the need for the study.

Learn the various metabolic cycles.

Analyze the significance of biochemical findings.

UNIT-I : BIOLOGICAL OXIDATION

Enzymes and co-enzymes involved in oxidation and reduction, respiratory chain, phosphates in biological oxidation and energy capture, components and role of respiratory chain and mechanism of oxidative phosphorylation ,inhibitors, uncouplers and mitochondrial disease.

UNIT-II : METABOLISM OF CARBOHYDRATE

Glycolysis, Gluconeogenesis, TCA cycle, HMP shunt, glycogen metabolism, bioenergetics, disorders of carbohydrate metabolism –fructosuria, galactosemia, glycogen storage disease, pentosuria, abnormal level in blood glucose.

UNIT-III : METABOLISM OF LIPIDS

Biosynthesis and oxidation of saturated and unsaturated fatty acids, glycerides, phospholipids and cholesterol, bioenergetics, lipoproteins and their significance, metabolism and disorders of lipoprotein metabolism.

UNIT-IV : PROTEIN AND AMINOACID METABOLISM

Biosynthesis of protein, general catabolism of aminoacids, glucogenic and ketogenic aminoacids, deamination, transamination, urea cycle, disorders of aminoacid metabolism - phenyl ketonuria, cystinuria, albinism, alkaptonuria, maple syrup disease.

UNIT-V : METABOLISM OF NUCLEIC ACIDS

Biosynthesis and degradation of purine and pyrimidine nucleotides, DNA replication and repair, biochemical importance of cyclic AMP. Disorders of purine and pyrimidine metabolism - gout, aciduria, xanthinuria, lesch-nyhann syndrome. Structure and properties of DNA, RNA - mRNA, tRNA, rRNA.

Functional tests - Gastric, liver, renal and endocrine.

REFERENCES:

1. Deb, A.C. (2002), Fundamentals of Biochemistry, New Central Book Agency (P) Ltd.
2. Nelson, L. and Michael.M.Cox. (2005), Lehninger Principles of Biochemistry, 4th Edition, W.H. Freeman and Company, NewYork.
3. Palmer, T. (1995), Understanding enzymes, 4th Edition, Prentice Halls, Ellis Horwood, London.
4. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2003), Harper's Illustrated Biochemistry, 26th edition, International Edition.
5. West, E.S., Todd, W.R., Mason, H.Sand and Van Brugge, T.J. (1966), Biochemistry, 4th edition, The Macmillan Company, London.
6. Voet, D., Voet, G.J. and Pralt, W.C. (2002), Fundamentals of Biochemistry, Upgrade edition, John Wiley and Sons, Inc.

PAPER – 8

RESEARCH METHODOLOGY AND APPLIED STATISTICS

OBJECTIVES:

To enable the students to :

understand the importance of Research.

learn about the various applications of statistics in the research.

Familiarize on writing the project report.

UNIT-I

Meaning of research, Types of research, Objectives of research.

Collection of Data - Methods of collecting data.

Primary and Secondary data - Sources of Primary and Secondary data, Editing the data and precautions used in the use of data. Different types of research tools for collecting research data, defining and determining a problem.

UNIT-II

Sampling Design - Census and sampling survey, Different types of sampling techniques - Probability and non-probability, size of the sample, Merits & Demerits of each sampling method, Sampling errors and methods of Reducing the error.

UNIT-III

Classification and Tabulation of Data - Meaning, Objective, Types of Classification, Formation of frequency distribution, Tabulation of data - Schemes general rules, Types of tables and preparation of tabular forms.

Representation of data - Diagrammatic and Graphic significance, Types of diagrams, Types of graphs.

UNIT-IV

Measures of central tendency - Mean, Median, Mode, their relative advantages and disadvantages. Measures of dispersion - mean deviation, standard deviation, Quartile deviation, Co-efficient of variation, percentile, Association of attributes, Contingency table, correlation - coefficient of correlation and its interpretation, Rank correlation, Regression equation and predictions.

UNIT-V

Probability - Theorems, Simple Problems, Distributions - Binomial Poisson distribution, normal distribution, their properties and simple problems.

Testing of significance - Large and Small sample tests - 't' test, Chi square test, and 'F' test - simple problems.

Writing a research report - format of thesis writing with eg.

REFERENCES:

1. Donald, H.M.C. Burney , Research Methods, fifth edition, Thomson and Wadsworth Publications, 2002.
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PAPER – 9

COMMUNITY NUTRITION

OBJECTIVES:

To enable the students to :

Understand the national nutritional problems and their implications.

Understand the malnutrition problems and its prevalence in India.

Gain knowledge on the national effort in combating malnutrition.

UNIT-I

Definition and brief study of community, family, village and block.

Malnutrition - causes, ecological factors, effects of malnutrition, protein deficiency diseases - PEM, Kwashiorkor - incidence, prevalence, epidemiology. The package programmes of immunization, marasmus, nutrition education, feeding programmes, and measures to overcome malnutrition.

Vitamin deficiency - A, B₁, B₂, Niacin, C, D, B₁₂, and Folic Acid - prevalence, programmes to combat.

Nutritional Anaemia - Prevalence, programmes to control.

IDD and fluorosis - Prevalence, causes, symptoms and programmes to control.

UNIT-II

Study of common nutritional problem prevailing at community level – Assessment of Nutrition status – Direct Assessment – anthropometry, laboratory examination (Bio Chemical), clinical examination, Diet Surveys, socio economic diet survey, for common nutrition problems. Indirect Assessment – Food Balance sheet, Ecological parameters and vital statistics.

UNIT-III

Nutrition and National Development, National nutritional policy - Aim, objectives, guidelines and thrust areas. PDS - Public distribution system, Agricultural planning - New strategies.

Concepts and definition of food and nutritional security at National household and individual levels.

UNIT-IV

Nutrition intervention Programmes - Objectives, operation of feeding programmes. ICDS, TINP, NNMS, IRDP, DWACRA.

National organizations - ICMR, NIN, NNMB, ICAR, CFTRI, NIPCCD.

International organizations - FAO, WHO, UNICEF, UNESCO, World Bank.

UNIT-V

Demographic changes due to malnutrition. IMR, MMR, Mortality, morbidity rate, birth rate, sex ratio, poverty level.

Nutrition education - Merits, planning, evaluation and conduct.

Health care delivery - PHC, School Health services and their role in preventing communicable diseases.

REFERENCES

1. Swaminathan M (2007), Essentials of Food and Nutrition. An Advanced Textbook Vol.I, The Bangalore Printing and Publishing Co. Ltd, Bangalore
2. Bhatt D.P (2008), Health Education, Khel Sahitya Kendra, New Delhi
3. Bamji M.S, Prahlad Rao N, Reddy V (2004). Textbook of Human Nutrition II Edition, Oxford and PBH Publishing Co. Pvt. Ltd , New Delhi
4. Park A. (2007), Park's Textbook of Preventive and Social Medicine XIX Edition M/S Banarasidas, Bharat Publishers, 1167, Prem Nagar, Jabalpur, 428 001(India)
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Journals:

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2. Reports of National Family Health Survey, International Institute for Population Science, Mumbai.
3. Indian Journal of Medical Research, ICMR, New Delhi,
4. Indian Journal of Pediatrics, Valley Nicro, Missouri, U.P.

ELECTIVE

PAPER – 3

NUTRITION IN EMERGENCIES

OBJECTIVES:

1. To gain knowledge in protecting people's right to nutrition during disaster
2. To prepare for emergencies ,to prevent hunger, malnutrition and deficiency disorders
3. To create an awareness on nutrition policies and programmes to combat nutritional problems

UNIT-I

Natural / manmade disasters resulting in emergency situations.

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.

UNIT-II

Nutritional problems in emergencies in vulnerable groups.

Causes of malnutrition in emergency situations.

Major deficiency diseases in emergencies.

Protein – energy malnutrition.

Specific deficiencies.

UNIT-III

Communicable diseases: Surveillance and treatment.

Control of communicable diseases in emergencies

Role of immunisation and sanitation.

Public nutrition approach to tackle nutritional problems in emergencies.

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 nutritive status – Indicators and cut – offs indicating seriously abnormal nutrition situation weight – for – height based indicators, MUAC, social indicators.

Organization of nutritional surveillances and individual screening.

UNIT-V

Nutrition 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.

Special foods / rations for nutritional relief.

Local production of special foods.

Local food rehabilitation.

Organization of mass feeding / general food distribution

Feeding centers

Transportation and food storage.

Sanitation and hygiene

Evaluation of feeding programmes.

REFERENCES

1. Shills, M.E., Olson, J.A, Shike, M and Ross, A.C. (2003): Modern Nutrition in Health and Disease, 9th Edition, A.Williams and Willdns.
2. Goyet, fish.. V.; Seaman, J. and Geijer, u-(2008): The Management of Nutritional Emergencies in Large Populations, World Health Organisation, Geneva
3. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet-Therapy, 10th Edition, W-13 Saunders Ltd.

ELECTIVE

PAPER – 4

FUNCTIONAL FOODS AND NUTRACEUTICALS

OBJECTIVES

To enable the students to gain:

- Knowledge on sources of Functional Foods and Nutraceuticals
- Knowledge on the role of functional foods, nutraceuticals and dietary supplements in health and disease

UNIT - I

Definition and History-Functional foods, traditional foods, nutraceuticals - teleology, designer foods and pharma foods, history of functional foods, components of functional foods, stages involved in development of functional foods.

UNIT- II

Classification - Based on food source, mechanism of action and chemical nature- isoprenoid, phenolic substances, fatty acids and structural lipids, terpenoids – saponins, tocotrienols and simple terpenes, carbohydrates and amino acid based derivatives, isoflavones.

UNIT- III

Functional foods of Microbial origin- Human gastrointestinal tract and its microbiota, functions, probiotic microflora and functions- Lactobacillus and Bifidobacterium, concept of probiotics and prebiotics with examples, role of probiotics in health and disease, spirulina as bioactive component.

UNIT – IV

Sources and role of Functional foods and Nutraceuticals - Role of functional foods and Nutraceuticals in diseases, concept of dietary supplements, phytochemicals, phytosterols, omega 3 and 6 fatty acids, dietary fiber, role of nutraceuticals in health and disease management – diabetes mellitus, hypertension, CVD, cancer; non essential nutrients as dietary supplements, FOSHU foods.

UNIT – V

Regulatory aspects- International and national regulatory aspects of functional foods in India, ICMR guidelines for Probiotics, development of biomarkers to indicate the efficacy of functional ingredients, Research frontiers in functional foods.

REFERENCES:

1. Bamji (2003), Textbook of Human Nutrition, 3rd edition, Oxford & IBH Publishing Co Pvt Ltd, New Delhi.
2. Srilakshmi.B (2012), Nutrition Science, 4th edition, New Age International Pvt Ltd.
3. Webb G.P (2006), Dietary Supplements and Functional Foods, Blackwell Publishing Ltd, New York.
4. Tamine. A (2005), Probiotic Dairy Products, Blackwell Publishing Ltd, United Kingdom.
5. USFDA regulations on functional foods.

Journals

1. Journal of functional foods
2. Journal of free radical research

PAPER - 3
INTERNSHIP

Internship:

A phase of training where in a graduate is expected to conduct actual practice in a hospital industry/food industry according to his or her choice for a period of 30 Days so as to acquire job oriented skills

Assessment:

Interns shall maintain a record book which shall be verified and certified by the training authority under whom he or she works during his/her internship period.

An objective evaluation of his/her knowledge, skills and attitude during training will be recorded by the center in-charge and monitored by faculty in-charge and marks shall be allotted accordingly.

Hospital authority	-	75
Internal Assessment & Viva Voce	-	25

SEMESTER IV
PAPER – 10
DIET THERAPY

OBJECTIVES

To enable the students to :

- Understand the principles of diet and Nutrition in the cause and treatment of disease.
- Understand the modifications in nutrients and dietary requirements for therapeutic condition.
- Learn recent concepts in dietary management of different diseases.

UNIT-I

Principle of Nutritional care, Types of hospital diets.

Nutrition Support Techniques, Enteral feeding - indications, Types - Nasogastric, Gastrostomy, Jejunostomy and Rectal feeding - requirements and advantages.

Parenteral feeding - Nutritional Support, Formula feeds and Complications in TPN.

UNIT-II

Diet in Febrile condition

Short duration - Typhoid, Influenza, Malaria, Long duration Tuberculosis.

Diet in deficiency diseases - PEM, Vitamin A, Anaemia

Surgery - Physiological response, Metabolic Consequences, Stage of Convalescence, pre and post operative diets.

Burns - Metabolic changes in protein and electrolytes and Nutritional support.

Diet in Energy Imbalance - Underweight and obesity, Etiology and dietary management.

Diet in allergy - Common food allergens, test for allergy - Skin test and Elimination diet and Treatment for allergy.

UNIT-III

Diseases of cardio vascular system - Risk factors of CVD, Etiology, Symptoms, and dietary management of atherosclerosis, Cerebral Infarction, Myocardial Infarction, prevention through life style modifications.

Classification, prevalence, Diet related factors influencing and dietary management of hypertension, dyslipidemia (Genetic Hyperlipidemia).

UNIT-IV

Diseases of the Gastro intestinal system- Disorders, Etiology, Symptoms and dietary management of Acute gastritis, Chronic gastritis, Peptic ulcer - duodenal & gastric Intestinal disease - Flatulence, Diarrhoea and Dysentery, Constipation, Celiac disease, Tropical sprue, Irritable bowel syndrome, diverticular disease, colon cancer, Ulcerative colitis.

Liver disease - Hepatitis, cirrhosis, Jaundice, fatty liver, cholecystitis and cholelithiasis, Hepatic coma.

Pancreas - Pancreatitis, Acute and chronic

Diabetes Mellitus - Etiology, Types, Symptoms, Diagnosis, metabolic alterations, complications and dietary management.

UNIT-V

Diseases of the Kidney - Etiology, Symptoms and Dietary modification, Nephritis, Nephrosis, Acute and chronic renal failure, Nephrolithiasis, Transplantation and dialysis, Dietary Modification.

Dietary modification and Nutritional Support for cancer, HIV, Alzheimer's and Parkinson's Disease.

REFERENCES

1. Srilakshmi. B (2012), Dietetics, New Age International Pvt Ltd, New Delhi.
2. Dietary Guidelines of Indians- A Manual, National Institute of Nutrition, Hyderabad, 2006.
3. Robinson C.H. (2007) Normal and Therapeutic nutrition, 12th edition, Mac Millan Publishing Co. Inc, New York.
4. Krause M.V and Mahan L.K (2010) Food, Nutrition and Diet therapy, 9th edition, W.B. Saunder Co, Philadelphia

Journals:

1. Clinical Nutrition, Bell and Bain Ltd., Scotland. Food and Nutrition Bulletin, United Nations University Press, Japan
2. The Indian Journal of Nutrition and Dietetics, Sri Avinashilingam Home Science College for Women, Coimbatore.
3. The American Journal of Clinical Nutrition Published by the American society for Clinical Nutrition, Inc., USA.
4. Journal of American Dietetic Association. The American Dietetic Association Mount Arris, Illinois-61054, USA.

CORE PRACTICAL – III
NUTRITIONAL BIOCHEMISTRY

1. Determination of Saponification Number.
2. Determination of Acid Number
3. Determination of Reichert Meissl Number.
4. Estimation of Creatinine in urine - Jaff's method.
5. Estimation of Serum cholesterol - Zak's method.
6. Estimation of Blood glucose - O -Toluedene method.
7. Estimation of Serum proteins by Biuret method.
8. Estimation of Albumin / Globulin ratio by biuret method.

COMMUNITY NUTRITION

1. Development of a plan for nutrition education programmes in community.
2. Preparation of communication aids for different groups.
3. Development of low cost recipes for infants, preschoolers, elementary
4. school children, adolescents, pregnant and lactating mothers
5. Planning and preparation of diet/ dishes for PEM, VAD and IDA
6. Field visits to ongoing national nutrition programmes

CORE PRACTICAL – IV

DIET THERAPY

1. Types of diet - Full liquid, clear liquid, soft, light, bland and regular diet.
2. Diet for - obesity, underweight, febrile conditions.
3. Diet in gastro intestinal disorders - peptic ulcer, diarrhoea, constipation.
4. Diet in liver disorders - jaundice, hepatitis, cirrhosis, hepatic coma, fatty liver and gall stones.
5. Diet in kidney disorders - Glomerulo nephritis, nephritic syndrome, renal failure, and urolithiasis.
6. Diet in Diabetes mellitus – Type1, Type2Diabetes mellitus, diabetes with complications.
7. Diet in Cardio vascular disease - Hypertension, atherosclerosis, congestive heart failure.
8. Visit to a hospital to observe - Enteral Feeding and formula diet for tube feeding.
9. Diet in deficiency diseases - Anaemia, underweight, obesity.

CORE PROJECT/DISSERTATION WITH VIVA VOCE

OBJECTIVES

An independent research work has to be undertaken by the students. The students will be guided and supervised by a member of a Teaching faculty of the concerned department. The Research can either be a survey or Laboratory oriented one. In which the research culminates should reflect the students own work. The Dissertation should be submitted at the end of the Semester.

Assessment

DISSERTATION: EVALUATION PATTERN

Internal : 25 marks

External (including Viva Voce) : 75 marks

ELECTIVE

PAPER – 5

FOOD BIOTECHNOLOGY

OBJECTIVES

Study of this paper will enable the students to

- Remain updated on recent advances in the application of genetic engineering in food.
- Develop an understanding about nano biotechnology in food industries.

UNIT I

Biotechnology – Introduction – biotechnological applications of animals, plants and microbes; concepts of genetic engineering and molecular cloning and their application in food production, transgenic plants, application of genetic engineering in food science and technology. Genomics, proteomics and bio informatics.

UNIT II

Classical strain improvement: Natural selections and mutation, recombination. Concepts and tools for recombinant DNA technology; genetically modified foods: concept, types and applications; safety assessment of genetically modified foods: International and National guidelines of regulations and safety, issues related to production, consumption, export / import and labelling of GM foods. Ethical issues concerning GM foods, Testing for GMOs, IPR, GMO Act 2004.

UNIT III

Application of biotechnology to food products: Yeast based processes and products – alcoholic beverages, industrial alcohols, bread and related products; Bacteria based processes and products – dairy products, fermented meat and fish products, fermented vegetable products, vinegar and other organic products, bacterial bio mass.

UNIT IV

Application of enzymes in food and beverages industries. Enzyme immobilization and its application in food industry: History, carrier materials, enzyme immobilization techniques, use of immobilized enzyme in food industries. Micro organism based products – sweeteners, flavours and amino acids, vitamin pigments, mushrooms, SCP.

UNIT V

Application of Nano biotechnology in food industry: Nano biotechnology in food packaging, nano biotechnology for delivery of bioactive and nutraceuticals, nano biosensors – safety and regulatory aspects of Nano biotechnology applications. Micro encapsulation in food biotechnology: concepts, agents and techniques; application of micro encapsulation – probiotics, flavours, lipids, antioxidants, vitamins and enzymes.

REFERENCES:

1. Byong H. Lee, fundamentals of food biotechnology, II editions, wiley – Blackwell, 2014.
2. Ravishankar Rai, V. Advances in food biotechnology, Wiley – Blackwell, 2015.
3. Bains W. biotechnology from A to Z, Oxford , University Press, 2009.
4. Lopez, G.F.G., Canovas, G.V.B., Food science and Food Biotechnology , CRC Press, 2003.
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