



TUMKUR UNIVERSITY

Department of Studies and Research in Food and Nutrition

Programme outline and syllabus for M. Sc., in Food and Nutrition of Tumkur University under CBCS scheme.

SEMESTER-I

Sl	Paper	Title of the Paper	Instructi on Hrs/ week	Credits	Duration of Exam (Hrs)	Marks		
						IA Marks	Exam Marks	Total Marks
1	CPT-1.1	Food Science	4	4	3	20	80	100
2	CPT-1.2	Advanced Nutrition	4	4	3	20	80	100
3	CPT-1.3	Food Microbiology	4	4	3	20	80	100
4	SPT-1.4.1	Nutritional Biochemistry	4	4	3	20	80	100
	SPT-1.4.2	Human Physiology	4	4	3	20	80	100
5	CPP-1.5	Food Science lab	4	2	4	10	40	50
6	CPP-1.6	Advanced Nutrition I Lab	4	2	4	10	40	50
7	CPP-1.7	Food Microbiology Lab	4	2	4	10	40	50
8	SPP-1.8.1	Nutritional Biochemistry lab	4	2	4	10	40	50
	SPP-1.8.2	Human Physiology Lab	4	2	4	10	40	50
Total				24				600

CPT-Core Paper Theory, SPT- Specialization Paper Theory, CPP- Core Paper Practical, SPP- Specialization Paper Practical

SEMESTER-II

Sl	Paper	Title of the Paper	Instruction Hrs/ week	Credits	Duration of Exam (Hrs)	Marks		
						IA Marks	Exam Marks	Total Marks
1	CPT-2.1	Vitamin and mineral nutrition	4	4	3	20	80	100
2	CPT-2.2	Lifespan Nutrition	4	4	3	20	80	100
3	SPT-2.3.1	Techniques in Food Analysis	4	4	3	20	80	100
	SPT-2.3.2	Food packaging & quality control	4	4	3	20	80	100
4	OET-2.4	Food Chemistry	4	4	3	20	80	100
5	CPP-2.5	Vitamin and mineral nutrition Lab	4	2	4	10	40	50
6	CPP-2.6	Lifespan Nutrition Lab	4	2	4	10	40	50
7	SPP-2.7.1	Techniques in Food Analysis Lab	4	2	4	10	40	50
	SPP-2.7.2	Food packaging & QC Lab	4	2	4	10	40	50
8	CPP-2.8	Food Chemistry	4	2	4	10	40	50
Total				24				600

CPT-Core Paper Theory, SPT- Specialization Paper Theory, OET- Open elective paper Theory, CPP- Core Paper Practical, SPP- Specialization Paper Practical, OEP- Open elective paper Practical.

SEMESTER-III

Sl	Paper	Title of the Paper	Instruction Hrs/ week	Credits	Duration of Exam (Hrs)	Marks		
						IA Marks	Exam Marks	Total Marks
1	CPT-3.1	Clinical nutrition and dietetics-I	4	4	3	20	80	100
2	CPT-3.2	Community health and statistics	4	4	3	20	80	100
3	SPT-3.3.1	Food technology and processing	4	4	3	20	80	100
	SPT-3.3.2	Food Biotechnology	4	4	3	20	80	100
4	OET-3.4	Diet and disease	4	4	3	20	80	100
5	CPP-3.5	Clinical nutrition and dietetics-I Lab	4	2	4	10	40	50
6	CPP-3.6	Community health and statistics Lab	4	2	4	10	40	50
7	SPP-3.7.1	Food technology and processing Lab	4	2	4	10	40	50
	SPP-3.7.2	Food Biotechnology Lab	4	2	4	10	40	50
8	OEP-3.8	Diet and disease Lab	4	2	4	10	40	50
Total				24				600

CPT-Core Paper Theory, SPT- Specialization Paper Theory, OET- Open elective theory, CPP- Core Paper Practical, SPP- Specialization Paper Practical, OEP- Open elective Practical

SEMESTER-IV

Sl	Paper	Title of the Paper	Instruction Hrs/ week	Credits	Duration of Exam (Hrs)	Marks		
						IA Marks	Exam Marks	Total Marks
1	CPT-4.1	Clinical nutrition and dietetics II	4	4	3	20	80	100
2	CPT-4.2	Food Preservation	4	4	3	20	80	100
3	SPT-4.3.1	Food fortification and sports nutrition	4	4	3	20	80	100
	SPT-4.3.2	Nutritional Systems Biology & Research Methodology	4	4	3	20	80	100
4	CPP-4.4	Clinical nutrition and dietetics II Lab	4	2	4	10	40	50
5	CPP-4.5	Food Preservation Lab	4	2	4	10	40	50
6	SPP-4.6.1	Food fortification and sports nutrition lab	4	2	4	10	40	50
	SPP-4.6.2	Omics science Lab	4	2	4	10	40	50
7	Project-4.7	Project work and Dissertation	12	6	4	20-Report 10-PP/viva	80 40	150
Total				24				600

CPT-Core Paper Theory, SPT- Specialization Paper Theory, CPP- Core Paper Practical, SPP- Specialization Paper Practical, Project- Project work, PP- Presentation, Viva- viva voce

Internal Assessments-

Max marks:20

Seminars in even semester

05 Marks

Industry visit and submission of report

05 Marks

Assessment (average of two test)

15 Marks

Total

20 Marks

Semester I

CPT-1.1: Food Science

(4 Credits: 64 h)

Unit I:

16 Hr

Cereal and Pulses: Milling of cereals, parboiling, nutrient loss during parboiling. Baking technology; bread, biscuits, cookies, leavening agents (different types and methods). Breakfast cereals. Pulses- types and processing of different pulses

Unit II:

16 Hr

Fruits and vegetables: Principles of fruits and vegetable preservation (heat, sugar, salt, fermented and dried). Pre-processing of fruits and vegetables (peeling, cutting and blanching). Principles of storage; natural, ventilated, low temperature. Fruit and vegetable juices, cordials, nectars, concentrates, jam, jellies, squash, syrups, marmalades, pickles. Theory of gel formation, FPO (Fruit product order)

Unit III:

16 Hr

Milk and milk products: Milk composition, factors affecting milk quality, physical and chemical properties of milk. Processing of milk- Separation, centrifugation, pasteurization, sterilization, homogenization, effect of processing on nutritive value. Quality test for milk-platform test, adulterant test and other quality checks, MPO (Milk product order)

Unit IV:

16 Hr

Meat, fish, poultry and egg: Meat- composition, slaughtering and related practices, ageing, and curing, smoking, tenderizing, colour changes during cooking. Fish - composition, quality factors, preservation, drying, salting, curing, smoking, fermented fish products and canning. Poultry- processing plant operation (slaughtering to packaging), cooking, flavor and colour changes. Eggs - composition, quality factors, pasteurization of eggs, egg substitutes and powdered egg, role of egg in cookery.

References

1. Fabriani, G and Lintas C. (1988) Durum wheat chemistry and technology. American Association of Cereal Chemistry Inc.
2. Winton and Winton (1991) Techniques of food analysis, Allied Scientific Publishers
3. Pomeranz Yeshuraj, Food Analysis; theory and practice
4. Matz A Samuel, Bakery Technology and Engineering
5. Meat Handbook- Lavie A., AVI Publishing, Westport, 1979

CPT-1.2 Advanced Nutrition

(4 Credits 64 Hrs)

Unit I:

16 Hrs

Basis for computing nutrient requirements - latest concepts in dietary recommendations: their uses and limitations. Methods to determine energy requirements and expenditure. Thermo genesis, adaptation to altered energy intake, latest concepts in energy requirements and RDA-ICMR and WHO, Energy requirements (BMR, physical activity), Factors influencing basal and resting

metabolism, energy metabolism, significance of carbohydrate in energy, trends in dietary intake of carbohydrate, glycemic index, energy balance, energy expenditure calculation of an average man and women. Body fluids and water balance - Body water compartments - Regulation of water balance - disorders of water balance – Body composition, Methods of study - compositional changes during life cycle - nutritional disorders and their effect on body composition.

Unit II:

16 Hrs

Carbohydrates: deficiency, sources and requirements. Carbohydrates in human nutrition and physiological functions. Starch as principle carbohydrate, analysis of quantity and quality of starch. Review of metabolism of carbohydrates (digestion, absorption, assimilation). Lactose intolerance. Dental caries. Sugar alternatives. Role of dietary fiber in health and disease. Disorders related to carbohydrate metabolism. Glycemic index of foods and its uses. RDA-ICMR and WHO

Unit III:

16 Hrs

Proteins – Sources and significance of protein in diet, Classification and Functions of dietary protein, Review of metabolism of Protein, Protein digestibility corrected amino acid score and concepts of essential and non-essential amino acids – their role in growth and development. food supplementation, essential amino acids and therapeutic application of amino acid. Physiological functions of proteins. Requirements, nitrogen balance concept. Methods of evaluating protein quality. Protein malnutrition – clinical features and biochemical changes. RDA-ICMR and WHO

Unit IV:

16 Hrs

Lipids – Significance of lipid and fatty acids, Classification and Functions, Review of metabolism of Lipid (digestion, absorption and assimilation, oxidation and energy release), trans fatty acids, requirements and dietary guidelines,.Concepts of visible and invisible fats, EFA, SFA, MUFA, PUFA, omega-3 and omega-6 fatty acids – sources and physiological functions. Role of lipoproteins and cholesterol, triglycerides in health and disease.

References

1. Shils, 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.
5. An introduction to the chemistry of carbohydrates- Honyman and Guthrie- 2000
6. Food science- Birch, G.G. et al., Pergamon press, New York, 1986
7. Principles of Food Science (part- I Food Chemistry)- Fennema, O R., Marcel Dekker, USA,1976
8. Introductory Nutrition - Guthrie A.H (1986) 6th edition, the C.V. Mosby company
9. Essentials of food and nutrition - M. Swaminathan., (1991), Vol I and II, Ganesh & Co. Madras
10. Biochemistry 5th ed.Berg JM, Tymoczko JL and Stryer L (2002) WH Freeman

CPT-1.3 Food Microbiology

(4 Credits 64 Hrs)

Unit I:

16 Hrs

Introduction: History and scope of food microbiology. Types of micro-organisms associated with food- mold, yeast, and bacteria. Factors affecting the growth of microorganisms in food - Intrinsic and Extrinsic parameters that affect microbial growth. Microorganisms in natural food products and their control. Methods of detection of microorganisms in food grains, oilseeds, fruits, vegetables and prepared and processed foods. Food preservation: Natural preservatives, food colourants, phenolic acids, phenylpropanoids, flavonoids and antimicrobial agents as common preservatives.

Unit II:

16 Hrs

Food spoilage: definition, characteristic features, dynamics and significance of spoilage of different groups of foods- Cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods. Biochemical changes caused by microorganisms, deterioration and spoilage of various types of food products – Physical, chemical and microbiological spoilages (Enzymatic or fermentative spoilage – rancidity, hydrolytic spoilage, putrefaction, souring, off flavour etc.; Texture deformations – slime, ropiness, curdling, discoloration etc.; Toxin production –endotoxins and exotoxins). Contamination of fruits vegetables, cereals, pulses, oilseeds, milk and meat during handling and processing. Microbial spoilage of foods and food items – milk, cereals, fruits and vegetables, meat, egg, fish, poultry.

Unit III:

16 Hrs

Food Processing and Fermentation: Importance of microorganisms in food industry and food preparations. Microbial production of dairy products- Curds, butter milk, acidophilus milk, srikhand, cheese. Preparation of soy fermentation products, meat and fish processing, processing of sea foods. Bakery products- processing and preparation of bakery products. Fermented foods- traditional fermented foods, Domestic processing and fermentation to enrich the quality of common foods. Enrichment of good quality, off flavour, Probiotics and prebiotics; Fermented foods based on milk, meat and vegetables; Fermented and alcoholic beverages.

Unit IV:

16 Hrs

Food borne diseases: *Bacterial food borne diseases* (*Staphylococcal* intoxication, Botulism, Salmonellosis, Shigellosis, Enteropathogenic *Escherichia Coli* Diarrhoea, *Clostridium perfringens* gastroenteritis, *Bacillus cereus* Gastroenteritis) *Food Borne Viral Pathogens* (Norwalk virus, Norovirus, Reovirus, Rotavirus, Astrovirus, Adenovirus, Parvovirus, Hepatitis A Virus) *Food Borne Animal Parasites* Protozoa – Giardiasis, Amebiasis, Toxoplasmosis, Sarcocystosis, Cryptosporidiosis. Cysticercosis/Taeniasis. Roundworm – Trichinosis, Anisakiasis. *Mycotoxins*: Aflatoxicosis, Deoxyvalenol Mycotoxicosis, Ergotism

References

1. Pelezar, M.I and Reid, R.D. (1993) Microbiology McGraw Hill Book Company, New York, 5th Edition.
2. Basic Food Microbiology -Banwart G J (1987), CBS Publishers and Distributors

3. Food Microbiology 4th Edition - Frazier WC, Westoff DC (1998), Tata Mc Graw Hill Publishing Co. Ltd
4. Microbiology 6th ed. - Prescott L M, Harley J P, Klein D A (2008) WMC Brown Publishers
5. Microbiology 5th ed., - Pelczar MJ, Chan ECS, Krieg N (1993) Tata McGraw Hill Publishing Co. Ltd

SPT-1.4.1 Nutritional Biochemistry

(4 Credits 64 Hrs)

Unit I:

16 Hrs

Metabolic pathways: Carbohydrates– Glycolysis, TCA cycle, glycogenesis, glycogenolysis, gluconeogenesis, HMP shunt pathway, Hormonal regulations of blood glucose. Bioenergetics – Principles of bioenergetics, free energy – endergonic and exergonic process, role of high energy compounds in energy storage, formation of ATP- Biological oxidation and electron transport chain - Reduction potentials, anatomical site and components of oxidative phosphorylation, chemiosmotic theory, inhibitors of respiratory chain.

Unit II:

16 Hrs

Protein and amino acids: Protein degradation, Protein digestion, fate of nitrogen (urea cycle), metabolism of aromatic, sulfur containing, BCAA and other amino acid pool. Glutamine and alanine cycle, Protein denaturation, transamination, decarboxylation, urea formation, synthesis and break down of haemoglobin. Nucleic acids- metabolism of nucleic acid components, biosynthesis of nucleotides.

Unit III:

16 Hrs

Lipids- Metabolism of triacylglycerol, β - oxidation of fatty acids, cholesterol biosynthesis. Regulation of lipid metabolism and ketone bodies. Oxidative stress and antioxidants – Free radicals – definition, formation in biological systems, defense against free radicals. Role of free radicals and antioxidants in health and disease. Determination of free radicals, lipid peroxides and antioxidants. Regulation of metabolism – Interrelationship of carbohydrate, protein and lipid metabolism, Role of Vitamins and Minerals in Metabolism, metabolic adaptation during starvation, exercise, stress and diabetes mellitus

Unit IV:

16 Hrs

Enzymes, Classification, Chemical nature, Role of enzymes in food metabolism, Enzyme inhibition, enzymes in diagnosis of organ diseases. Significance of enzymes in digestion of food, Role of Enzymes in food and feed processing, juice and wine making. clinical significance of enzymes and enzyme based assays. Hormones: Classification – synthesis - regulatory functions and mechanism of hormone action. - Prostaglandin – structure, biosynthesis, metabolism and biological action and their role in pathology.

References

- 1) Harpers biochemistry- R K. Murray, D KGranner, P A Mayes, V W Rodwell- Macmillan Pub
- 2) Lehninger's Principles of Biochemistry, Nelson DL, & Cox MM (2000): 3rd Ed. Macmillan's
- 3) Text Book of Biochemistry Lubert Stryer

- 4) Text book of Biochemistry West and Tod
- 5) Biochemistry by Voet and Voet
- 6) A manual of laboratory techniques edited by Raghuramulu N., Nair MK and Kalyansundaram S.NIN ICMR 1983
- 7) Fundamentals of clinical chemistry edited by Tietz NW WB Saunders Co. 1976
- 8) Fundamentals of biochemistry- J.L. Jain, S. Chand & Company Ltd, Ram New Delhi
- 9) Text book of biochemistry with clinical correlation, T M Delvin – Wiley Lissinc

SPT-1.4.2 Human Physiology

(4 Credits 64 Hrs)

Unit I:

16 Hrs

Transport and Defence: Blood: composition, plasma, blood cells, hemoglobin, blood clotting process, heartbeat, initiation, contraction regulation, physiology of circulation. Adipose tissue structure, composition, deposition of triglycerides in adipose tissues, role of brown adipose tissues in thermogenesis. Immunity: immune response, antibody, cell mediated and humoral immunity

Unit II:

16 Hrs

Movement and coordination: Organization of body, structure of skeletal, cardiac, smooth and physiology of muscle contraction, structure of brain and neurons, physiology of nerve impulse conduction, excitability of membrane, electrical and chemical transmission between cells. Sensory organs, structure and their functions. Hormones: classification synthesis, regulatory functions and mechanisms of hormone action

Unit III:

16 Hrs

Digestion and respiration: Structure of digestive tract, enzymes in digestion, regulators of GI activity, mechanical and biochemical aspects of digestion, absorption, and transport of major nutrients. Liver- role of liver in processing and distribution of nutrients absorbed from small intestine, inter relationship of major metabolism in liver, excretory functions and storage,

Unit IV:

16 Hrs

Excretion, detoxification and reproduction: Excretion: Internal structure of kidney and nephron, fluid and electrolyte balance, acid and base balance, physiology of excretion, roles of kidney in body water regulation. Detoxification: Definition. Xenobiotics, enzyme, systems involved mechanisms of detoxification. Oxidative stress and anti-oxidants in health free radicals, role of free radicals and antioxidants in health and diseases. Reproduction: female and male reproductive organs structure and functions, reproductive health and nutritional requirements

References

1. Human physiology Vol I & II – C C Chatterjee, Medical Allied agencies
2. Review of medical physiology- W F Mukherjee, Tata McGraw Hill
3. Text book of Physiology Vol I & II A K Jain, Avical Publishing Co., New Delhi
4. Textbook of Medical Physiology 9th Ed. - Guyton A C. Hall, J E 1996: Prism Books Pvt Ltd., Bangalore
5. Text book of medical physiology, Sembulingam

CPP-1.5 Food Science Practical

(2 credits)

FOOD SCIENCE Lab

1) **Cereals:** Preparation of baked products using leavening agents (bread, biscuits, cookies)

2) **Fruits and Vegetables**

Preservation of fruits and vegetables by various methods – Dehydration, Pickling, High concentration, Freezing, Chemicals, Canning

3) **Milk-** Milk adulteration test, Milk platform test, pH, sensory evaluation, Milk product order, Preparation of fermented and non-fermented milk products.

Analysis of chemical properties of milk- Specific gravity, Total solids, Acidity, Lactose content

4) **Egg-** Egg quality evaluation, Egg cookery

CPP- 1.6 Advanced Nutrition Lab

(2 credits)

1) Determination of energy value of food using Parr oxygen bomb calorimeter

2) estimation of starch, maltose, Glucose

3) Qualitative analysis of sugars, proteins and amino acids

4) Nitrogen analysis by Kjeldhal method

5) Estimation of amino acid by Sorenson's formaldehyde titration method or colorimetric method

6) Protein estimation by Lowry's method

7) Crude lipid estimation- groundnut, egg yolk, soya product

8) Estimation of total lipid in egg yolk

CPP- 1.7 Food Microbiology Lab

(2 credits)

1. Preparation of common laboratory media and special media.

2. Staining: Gram's staining, acid-fast, spore, capsule and flagellar staining, Motility of bacteria, Staining of yeast and molds..

3. Identification of important molds and yeast.

4. Microbiology of milk.

5. Microbiology of water.

6. Microbiology of hand and effect of sanitation on the hand microbiology in a small food joint.

7. Microbiological analysis of typical processed food.

8. Microbiological analysis of a typical unprocessed food.

9. Isolation of specific culture

SPP-1.8.1 Nutritional Biochemistry Lab

(2 credits)

1) Techniques used in biochemical analysis

a) Determination of pH in acids, alkalis and buffers using pH meter and indicators

b) Colorimeters – use of colorimeter in UV and visual range, flame photometer, flourimeter (principle to be explained and demonstrated with one example for each)

c) Separation techniques- chromatography- paper and Column. Centrifugation, electrophoresis and dialysis (one example for each may be demonstrated)

2) Assay of amylases

3) Assay of proteases

4) Isolation of lipase and assay of its activity

5) Analysis of amino acids

6) Analysis of lipid and fatty acids

- 7) Blood analysis- enumeration of RBC & WBC. Blood glucose, serum albumin, globulin, phosphorous, calcium, cholesterol and urea.
- 8) Urine analysis- quantitative- sugar, albumin and microscopy

SPP-1.8.2 Human Physiology Lab

(2 credits)

- 1) Study of hemocytometer
- 2) Blood groups
- 3) Estimation of hemoglobin
- 4) Total WBC count
- 5) Total RBC count
- 6) Total platelet count
- 7) Packed cell volume
- 8) Blood indices

Semester II

CPT-2.1: Vitamin and mineral nutrition

(4 Credits: 64 h)

Unit I:

16 Hrs

Fat soluble vitamins: Classifications of vitamins, History, chemistry, toxicity, fat soluble vitamin- A, D, E & K, Physiological action, transport and utilization, Storage, dietary sources, losses during preparation and handling, conversion of β -carotene into vitamin A. Vitamin like compounds and Pseudo vitamins: Choline, carotene, inositol, taurine, flavanoid, pangamate, Vitamin drug interaction.

Unit II:

16 Hrs

Water soluble vitamins: Thiamine, riboflavin, niacin, vitamin B12 – functions, digestion, absorption, utilization, deficiency and sources. Folic acid, pyridoxine, pantothenic acid, biotin, ascorbic acid- functions, digestion, absorption, utilization, losses in preparation and handling, deficiency and sources.

Unit III:

16 Hr

Macro minerals: Calcium, phosphorus: Calcium in skeleton and other tissues, bone mass and effect of diet, calcium absorption and utilization, calcium balance, requirement, sources, deficiency and toxicity. Phosphorus: concentration in the body, calcium and phosphorus ratio, absorption and utilization, deficiency and toxicity. Sodium, Potassium, magnesium and Sulphur: Metabolism and electrolyte balance, absorption, utilization, role in human nutrition, deficiency, toxicity, sources

Unit IV:

16 Hr

Micro minerals: Iron, iodine, zinc, copper, cobalt; metabolism, role in human nutrition, deficiency, toxicity, role of prevention for the deficiency. Ultra trace minerals: Cobalt, Nickel, Cadmium. Manganese, molybdenum, chlorine, selenium, fluorine: Metabolism, role in human nutrition, deficiency, toxicity, sources, Minerals and drug interaction

References

1. Nutrition Science, B. Srilakshmi
2. Clinical Nutrition. Gibney M J, Elia M, Ljungqvist & Dowsett J (2005) The nutrition Society Textbook Series, Blackwell publishing Company
3. Basic Nutrition and Diet Therapy 11th ed. Williams, S R (2001), Times Mirror Mosby College Publishing
4. Krause's Food and Nutrition Therapy 12th ed., Mahan, L K and Escott Stump S. (2008), Saunders Elsevier
5. Nutrition Science, B. Srilakshmi
6. Clinical Nutrition. Gibney M J, Elia M, Ljungqvist & Dowsett J (2005) The nutrition Society Textbook Series, Blackwell publishing Company
7. Basic Nutrition and Diet Therapy 11th ed. Williams, S R (2001), Times Mirror Mosby College Publishing
8. Krause's Food and Nutrition Therapy 12th ed. Mahan, L K and Escott Stump S. (2008), Saunders Elsevier

CPT-2.2: Lifespan nutrition

(4 Credits: 64 h)

Unit I:

16 hr

Principles of meal planning: Balanced diet, Food groups. Food exchange list. Factors effecting meal planning and food related behaviour. Dietary guidelines for Indians and food pyramid. Nutrient requirements. Concept of Dietary Reference Intakes. Overview of methods for assessment of nutrient needs. Nutrition for new born, weaning child, up to 1 year and up to 5 years of age. Reasons for under 5 age stunting, underweight, and deaths. Reasons for under 5 age children obesity, over weight and consequences. Meal planning for under 5- age children.

Unit II:

16 Hr

Young adults: Nutritional requirements, nutritional problems common to this age. Adult: Nutrient requirements for adult man and woman, Nutrition and meal planning for adulthood and old age people. Nutritional status of Indian adult population, RDA, nutritional guidelines, nutritional concerns, diet and lifestyle related diseases and their prevention. Elderly: Physiological changes in elderly, RDA, Nutritional requirements, special needs, nutritional problems health concerns in old age and their management, factors contributing to longevity.

Unit III:

16 Hr

Nutrition during pregnancy and lactation. Pregnancy: Physiological adjustments, nutritional requirements, nutritional status of Indian Pregnant women, optimal weight gain and its components, effect of malnutrition on outcome of pregnancy, complications of pregnancy. Lactation: Physiology of lactation, factors affecting lactation, nutritional requirements, effect of lactation on maternal malnutrition and fertility.

Unit IV:

16 Hr

Nutrition during childhood: Infancy: Growth and development, growth reference/ standards, RDA, nutritional guidelines, feeding pattern, compositional differences between human milk and milk substitute and their suitability for infant feeding. Weaning practices, weaning and supplementary foods. Nutritional concerns and healthy food choices. Preschool children: Growth and development, nutritional requirements, special care in feeding pre-schoolers, nutritional problems specific to this

age. School age and adolescent children: Growth and development, nutritional requirements, factors affecting their eating habits, nutritional problems specific to this age.

References

1. Textbook of Nutrition and Dietetics. Khanna K, Gupta S, Seth R, Passi SJ, Mahna R, Puri S (2013) Phoenix Publishing House Pvt. Ltd.
2. Perspectives in Nutrition, 6th edition. Wardlaw GM, Hampi JS, DiSilvestro RA (2004). McGraw Hill. Dietary Guidelines for Indians, ICMR (2011), NIN, Hyderabad.
3. Dietary Allowances for Indians. ICMR (2010), NIN-Hyderabad.
4. Nutrition: A Lifecycle Approach, Chadha R., Mathur P eds. (2015). Orient, New Delhi.
5. Diet Planning through the Life Cycle: Part 1 Normal Nutrition, Seth V and Singh K (2006) A Practical Manual. Elite Publishing House Pvt. Ltd. New Delhi.
6. Nutritive Value of Indian Foods. Gopalan C, Rama Sastri BV, Balasubramanian SC (1989) National Institute of Nutrition, ICMR, Hyderabad.

SPT-2.3.1: Analytical Techniques in Food Science (4 Credits: 64 h)

Unit I:

16 Hr

Proximate analysis of foods and feeds (moisture, nitrogen, crude fiber, crude lipids and ash). Mineral analysis of foods and feeds. Vitamin assay (water soluble and fat soluble). Standard methods of analysis of antinutritional factors phytic acid, phenolic acids, tannins and polyphenols. Methods of analysis of Flavonoids and isoflavonoids. Standard methods for the determination of antioxidant capacity of food. Estimation of secondary metabolites (antibiotics), Quantification of organic acids (citric acid).

Unit II:

16 Hr

Techniques – Paper chromatography, TLC, Gel filtration, ion exchange, affinity chromatography, HPLC and GLC. Applications of AAS, Mass spectrometry and NMR in nutrition, Spectroscopy - UV-visible, fluorescent spectroscopy, CD spectroscopy. Radiotechniques – nature of radiation sources, radioactive decay, units of radiation, detection and measurements of radioactivity, autoradiography, GM counter, Scintillation counter.

Unit III:

16 Hr

Classification and significance of dietary fiber, standard methods for the determination of dietary fiber, Standard methods of analysis of quantity and quality of starch (amylose, amylopectin, resistant starch). Standard methods of analysis of quantity and quality of dietary protein, protein digestibility, processing methods to enhance protein digestibility, lectins and their role. Methods to determine amino acid composition of protein, protein quality assessment- methods of analysis of essential amino acids. Standard methods of analysis of lipids and fatty acids.

Unit IV:

16 Hr

Sources of microbial contamination of foods. Methods of analysis of contaminating microorganisms and toxins in prepared foods, fermented foods, packaged foods and canned foods. Determination of aflatoxins in foods. Optimisation of PCR reactions and application in food technology, immunological techniques. Methods for extraction, isolation and purification of soluble and membrane bound enzymes. Criteria for purification.

References

1. A manual of Laboratory Techniques – Raghuramulu et al., NIN, ICMR, Hyderabad, 1983
2. An introduction to practical Biochemistry – Plummer, D.T. McGraw Hill Pub. Co., NY, 1971
3. Basic Concepts of Analytical Chemistry (2nded), S.N. Khopkar. New Age Pub.
4. Biophysical Chemistry – Principles and techniques – A. Upadhaya Himalaya pub.
5. Developments in Food Analysis – King R.D., Applied Science Publishers Ltd., London, 1978
6. Methods of Food Analysis – Joslyn, M.A., Academic Press, New York, 1970
7. Nuclear and Radio Chemistry – 3rd ed. Friedlander G., Kennedy JW., Macias ES., et al. John Wiley and sons, 1981
8. Practical Immunology – Hudson et al., Blackwell scientific pub., 1986
9. Principles of Gene Manipulation – Old and Primrose, Blackwell scientific Pub., 1994
10. Principles of Instrumental Analysis. D.A. Skooge Holt-Saunders, 1985
11. Separation Methods in Biochemistry – Morris, C.J. and Morris, P., pitman Publ., London, 1976

SPT-2.3.2: Food packaging and quality control

(4 Credits: 64 h)

Unit I:

16 Hr

Food packaging: Definition, objectives and functions of packaging and packaging materials. Types of packaging materials, properties of packaging materials, Packaging requirements and selection of packaging materials. Sanitation and hygiene, GMP, GLP. Food packaging systems: Different forms of packaging such as rigid, semi-rigid, flexible forms and different packaging system for (a) dehydrated foods (b) frozen foods (c) dairy products (d) fresh fruits and vegetables (e) meat, poultry and sea foods.

Unit II:

16 Hr

Packaging equipment and machinery: Vacuum, CA and MA, automated and real time monitoring CAM packaging machine; gas packaging machine; high speed shrink wrapping, flow wrapping, poly-bagging, horizontal and vertical bagging, seal and shrink packaging machine; form and fill sealing machine; aseptic packaging systems; bottling machines: carton making machines.

Unit III:

16 Hr

Quality control and quality assurance: Importance and functions, statistical quality control. TQM, GMP, GLP and HACCP its implementation in various food industries. ISO system, Food adulteration, Sensory evaluation-introduction, panel screening, Sensory and instrumental analysis in quality control, IPR and Patents.

Unit IV:

16 Hr

Methods of quality assessment of food materials: Fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products. Sanitation and hygiene, GMP, GLP, Statistical quality control. Food laws and standards, PFA, AGMARK, FSSAI.

References

1. Guide to Quality Management Systems for the Food Industry - Early. R., (1995), Blackie, Academic and professional, London.
2. Total Quality Assurance for the Food Industries - Gould, W.A and Gould, R.W. (1998), CTI Publications Inc. Baltimore.
3. Hazard Analysis Critical Control Point Evaluations - A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage - Bryan, F.L. (1992), World Health Organization, Geneva.
4. Manuals of Food Quality Control. 2 Additives Contaminants Techniques Food and Agricultural Organization (1980), Rome.
5. Hand Book of Indices of food Quality and Authenticity - Singhal, RS., Kulkarni PR., DV. Rege, (1997), wood head Publishing Ltd.
6. Food Packaging: Principles and Practice (2nd Ed.), - Robertson, G.L. (2006). Taylor & Francis
7. Principles of Foods Packaging (2nd Ed.), - Sacharow, S. and Griffin, R.C. (1980), Avi, Publication Co. Westport, Connecticut, USA.
8. Active Food Packaging - Rooney, M.L. (1995), Blackie Academic & Professional, Glasgow, UK.
9. Food Packaging Technology Handbook, NIIR Board, National Institute of Industrial Research, 2003.
10. Novel Food Packaging Techniques - Ahvenainen, R. (Ed.), CRC Press, 2003
11. Innovations in Food Packaging - Han, J.H. (Ed.) Elsevier Academic Press, 2005

OET-2.4: Food chemistry

(4 Credits: 64 h)

UNIT - I

16 hours

Water content in foods: Physical properties and structure of water and ice, biomolecular- water interaction, water activity and relative vapour pressure. **Dispersed systems:** Surface phenomena, colloidal interactions, Liquid dispersions, gels, emulsions and Foam. Moisture content of foods- grains, oil seeds, vegetables and fruits and its effects on shelf life of foods. Effect of environmental factors on moisture content of foods.

UNIT - II

16 hours

Carbohydrates: Monosaccharides, Oligosaccharides, Polysaccharides, Starch, Cellulose, Guar and Locust Bean Gum, Xanthan, Carrageenans, Algins, Pectins, Gum Arabica and Dietary fiber **Lipids:** Classification, physical aspects, chemical aspects, chemistry of fats and oil processing, role of food lipids in flavor, physiological effects of Lipids.

UNIT - III

16 Hr

Amino Acids, Peptides and Proteins and micronutrients: Protein functions and classification, dietary protein and its sources, significance of protein in diet, protein deficiency diseases, Physiochemical properties of amino acids, role of amino acids in human nutrition, Sources, deficiency symptoms of fat and water soluble vitamins. Role of minerals in human nutrition.

UNIT – IV

16 Hr

Food colorants: pigments in animal and plant tissues. **Flavors:** Taste and nonspecific saporous sensations, vegetable, fruit and spice flavor. **Food additives:** Acid, bases, buffer systems, chelating agent, antioxidant, antimicrobial agent, sweeteners, fat replacers and Mastigatory substances.

References

1. Beltz, H.D. 2005. Food Chemistry. Springer Verlag.
2. Fennema, O.R, 2006, Food Chemistry, Academic Press.
3. Meyer LH. 1987. Food Chemistry. CBS publishers and Distributors, New Delhi.
4. Potter NN & Hotchikiss JH. (2006), Food Sciences, 5th Ed. CBS publ and Distrib, New Delhi.
5. Fennema OR.2006. Food Chemistry. Marcel Dekker.

CPP-2.5: Vitamin and mineral nutrition

(2 credits)

- 1) Estimation of carotene from any 03 food samples
- 2) Analysis of food for thiamine and riboflavin (03 samples)
- 3) Estimation of vitamin C by EDTA method (03 samples)
- 4) Estimation of vitamin C losses during processing
- 5) Preparation of vitamin rich foods
- 6) Fortification with any 02 vitamin rich foods
- 7) Qualitative analysis of minerals
- 8) Estimation of iron, phosphorous, calcium in any three food stuffs
- 9) Preparation of iron, calcium, phosphorous rich foods
- 10) Fortification mineral rich foods

CPP-2.6: Lifespan nutrition Lab

(2 credits)

- 1) Determination of starch, protein, tannin, polyphenols, phytic acid content in foods
- 2) Planning of foods for different age groups based on the nutrition table and RDA
- 3) Introduction to meal planning: Use of food exchange list
- 4) Planning and preparation of diets and dishes for: a) Young adult b) Pregnant and Lactating woman c) Preschool child d) School age child and adolescents e) Elderly
- 5) Planning complementary foods for Infants, IDA adolescent girl
- 6) Estimation of iodine content in different foods and salt
- 7) Estimation of any two water soluble and fat soluble vitamins

SPP-2.7.1 Analytical Techniques in Food Science

(2 credits)

- 1) Estimation of moisture content, crude protein, crude ash, fiber, calcium, phosphorus
- 2) Estimation of sugars, fat, free fatty acids, acid value, iodine number, peroxide value,
- 3) Estimation of protein by Lowry's method
- 4) Estimation of Total Antioxidants, ascorbic acid, thiamine, riboflavin,
- 5) Estimation of calcium, phosphorus,
- 6) Estimation of Vitamin A, β carotene, cholesterol
- 7) Factors affecting enzyme activity
- 8) Chromatographic techniques - paper, TLC, Column
- 9) Estimation of organic acids
- 10) Verification of Beer Lambert's Law
- 11) Isolation of DNA / RNA
- 12) Immunological techniques

SPP-2.7.2 Food packaging and quality control

(2 credits)

- 1) Assessment of air using Surface Impingement method.
- 2) Detection of efficacy of surface sterilization using swab and Rinse method.
- 3) Determination of water vapour transmission rate for different materials.
- 4) Estimation of toxins and pesticides in food.
- 5) Detection of adulteration in foods.
- 6) Qualitative tests for detection of adulterants
- 7) Test for assessment of purity of water
- 8) Test for assessment of quality of milk and milk products
- 9) Test for assessment of quality of cereals/millet
- 10) Test for assessment of quality of pulses
- 11) Test for assessment of quality of fats and oils
- 12) Test for assessment of quality of meat/fish products
- 13) Test for assessment of quality of canned/bottle fruits and vegetables
- 14) Test for assessment of quality of baked foods

OEP 2.8-Food Chemistry Lab

(2 credits)

1. Determination of boiling point and freezing point of water
2. Estimation of moisture content, starch, total reducing and non-reducing sugars
3. Stages of sugar cookery
4. Estimation of gluten content
5. Estimation of polyphenols
6. Determination of acidity
7. Determination of gelatinization
8. Determination of natural pigments in foods
9. Fat acidity in foods-flour
10. Determination of refractive index of fats

Semester III

CPT-3.1: Clinical nutrition and dietetics

(4 Credits: 64 h)

Unit I:

16 Hrs

Concept of balanced diet, Introduction to clinical nutrition and therapeutic diet, Diet therapy, classification of therapeutic diet, objectives and functions of diet therapy, Concept of inter relationship between foods, health and nutrition. Hospital diet, special feeding methods, pre and post-operative diet, team approach in patient care, inter personal relationship with patient, role of dietitian in hospitals.

UNIT II:

16 Hrs

Dietary management in common disease condition, Diet in fever (acute and chronic) -typhoid, malaria, tuberculosis, injury, burns, arthritis, rheumatoid and osteo-arthritis, asthma, chronic pulmonary diseases, dietary management

UNIT III:

16 Hrs

Etiological factors and dietary modifications, Obesity, underweight, protein energy malnutrition, types of obesity, etiological factors, assessment of obesity, theory of obesity – fat cell theory and set point theory, dietary modification, anorexia, bulimia nervosa, Diabetes mellitus: etiology, types, symptoms, diagnosis, treatment, complications, physical activity and diabetes mellitus, glycemic index and glycemic load.

UNIT IV:

16 Hrs

Diet in Gastro intestinal disorder, Peptic ulcer, constipation, diarrhoea, steatorrhea, celiac disease, inflammatory bowel syndrome, diverticular disease, lactose intolerance, gout, dumping syndrome, crohn's disease, constipation.

References

- 1) Dietetics- B. Srilakshmi- New Age International (P) Limited, New Delhi
- 2) Normal and Therapeutic nutrition - C H Robinson, Oxford & IBH Publishing Co, Calcutta
- 3) Text book of Human Nutrition – M S Bamji, P. N Rao & Reddy- Oxford & IBH Publishing Co. Pvt. Ltd.
- 4) Towards Better Nutrition- Problem & Policies - C. Gopalan & S. Kaur, NFI publications
- 5) Jeffrey I. Mechanick, Elise M. Brett (Eds.). 2006. Nutritional strategies for diabetic and prediabetic - Edited by CRC Press.
- 6) Sholfes, Understanding normal and clinical nutrition.

CPT-3.2: Community nutrition and statistics

(4 Credits: 64 h)

UNIT I:

16 Hr

Public health aspects of malnutrition: Public health nutrition: Principles and concepts in public health nutrition. Types and magnitude of public health problems in India. Community and health Management: Health concept, definition, positive health, health situation in India, Health indices: fertility indicator, vital statistics, mortality and morbidity, human development index, health care, principles of health care. Protein energy malnutrition- etiology, types, prevalence, metabolic and physiological changes and prevention. Malnutrition prevention programmes, causes, types, control programme in India. Health care services by Government, health programs in India, nutrient deficiency prophylaxis programmes in India (Vitamin A, Iodine, Iron). Assessment of nutritional status; anthropometric, clinical, biochemical, dietary, vital health status.

UNIT II:

16 Hr

Role of international and national organizations in public health: FAO, WHO, UNICEF, CARE, NIN, NNMB, ICAR, ICMR, CFTRI, PHC, ESI. Nutrition education- importance, objectives, methods of nutrition education, nutrition education programme

UNIT III:

16 Hr

Nutrition and health of women: Women and health system, women's welfare programme, national nutrition programmes for women, empowerment and role of education for women, national and voluntary agencies in improving women's situation in India

UNIT IV:

16 Hr

Application of Statistics: Use of computers in statistical analysis. Analysis of data- measures of central tendencies (mean, median and mode), measure of dispersion (range, mean deviation and standard deviation). Testing of hypothesis. t-test, chi-square test for comparing variance. Analysis of variances, Co-variances and multivariate techniques- concept of ANOVA, one-way and two-way ANOVA, analysis of Co-variance, classification of techniques and important methods of factor analysis- R- type and Q- type factor analysis. Interpretation: meaning of interpretation, techniques of interpretation, precaution in interpretation- interpretation of tables and figures

References

- 1) Bamji M S, P. N Rao & Reddy Text book of Human Nutrition –Oxford & IBH Publishing Co. Pvt. Ltd.
- 2) Dutt P. R., Primary Health Care Vol I-III, Gandigram Institute of Rural Health & Family Welfare Trust, Ambathurai
- 3) Manelkar R K., A Textbook of Community Health For Nurses, Vora Medical Publications, Mumbai
- 4) Bhatia A., Health Promotion in Public- Anmol Publications, New Delhi
- 5) William C. Shefler, 1969Statistics for Biological Sciences- .Addison Wesley, California
- 6) Zar, J. H, 1974Biostatistical analysis- Prentice Hall, New Jersey
- 7) Alvin E. Lewis 1971Biostatistics, Affiliated East West, New Delhi
- 8) Jelliffee BD. 1966. The Assessment of the Nutritional Status of the Community. WHO.
- 9) Jolliffee N. 1962. Clinical Nutrition. Hoeber Medical Division. McLaren DS. 1983.
- 10) Park JE & Park K. 2000. Nutrition in the Community. John Wiley & Sons. 29
- 11) Shukla PK. 1982.Text Book of Preventive and Social Medicine. Barnasidas Bhanot Publ. SCN News, United Nations. System Forum on Nutrition. WHO.

SPT-3.3.1 Food technology and processing

(4 Credits 64 Hr)

Unit I: Nanotechnology

16 Hr

Nano particles, role of nano particles in agriculture (pesticides), processing (drinking water purification), functional classification and examples – nano-barriers, nano-antimicrobials, nano-sensors, nano-foods (flavorings, emulsion, viscosifiers and preservatives), nano packaging materials in improved packaging, active packaging and intelligent packaging. Current scenario and acceptance.

Unit II: Trends in packaging

16 Hr

Plastics and polymers, tetra packaging, retort pouch processing, aseptic packaging, modified atmosphere packaging, smart packing: active packaging (oxygen scavengers, ethylene scavengers, carbon dioxide emitters, moisture controllers, light absorbers, odor removers, antimicrobials and antioxidants) and intelligent packaging (time-temperature indicators, oxygen indicators, carbon dioxide indicators, microbial growth indicators, pathogen indicators), edible films and coatings, ethanol vapor generators. Controlled atmosphere, MAP (Modified atmospheric packaging), coating and enrobing, packaging materials specially designed for processed foods, advantages and disadvantages. Interaction between packaging material and food, aseptic processing and aseptic packaging.

Unit III:

16 Hr

Basic operation in food processing: Mixing, stirring, cooling, separation, evaporation, forming/moulding, processing of extruded products, rendering, refining, tempering, thawing, canning. **Basic principles of cold processing of foods and irradiation:** Refrigeration, freezing of foods, initial freezing point, freezing curve, changes during the freezing, rate of freezing, damage from intermittent thawing, factors affecting the freezing rate, freezer burn. Irradiation of foods – methods, safety aspects, regulations, food selection.

Unit IV:

16 Hr

Non Thermal and thermal Processing: High Pressure Processing (HPP), Use of gases (ozone, chlorine dioxide, cold plasma), Light (UV, pulsed light), Use of chemicals (chlorine, surfactants) and ionized radiation (gamma radiation, electron beam), benefits of non thermal processing over thermal processing. **Basic principles of thermal processing:** Thermal food processing, canning, steps and process, heat penetration into cans, cold point in food mass, determination of process time, thermal death time determination, TDT curve. Heating food in containers, hydrostatic cooker or cooler, hot pack and hot fill, inoculated pack studies.

References

- 1) Braun D., Cherdrón H., Rehahn M., Ritter H. and Voit B. (2005), Ed: 4, Springer Berlin Heidelberg New York, Polymer Synthesis: Theory and Practice.
- 2) Howard Q. Zhang, Gustavo V. Barbosa-Canovas, V. M. Bala Subramaniam, C. Patrick Dunne, Daniel F. Farkas and James T. C. Yuan (2011), Wiley-Blackwell, Nonthermal Processing Technologies for Food.
- 3) Rajja Ahvenainen (2003), CRC Press, Woodhead Publishing Limited, Cambridge London, Novel Food Packaging Techniques.
- 4) Richard Coles, Dereck McDowell and Mark J. Kirwan (2003), CRC Press, Blackwell Publishing, Food Packaging Technology.
- 5) Fabriani, G and Lintas C (1988) Durum Wheat Chemistry and Technology, American Association of Cereals Chemistry Inc.
- 6) Kent N L (1993), Technology of Cereals., 4th ed, Pergamon Press
- 7) Olson, V M Shemwell G A and Pasch S (1988) Egg and Poultry, Meat Processing
- 8) Fellows P J (2002), Food Processing Technology- Principles and Practices, 2nd ed. Woodhead Publishing Ltd.
- 9) Potter and Hotchkiss Oxford Univ. Press
- 10) Manay NS & Shadaksharaswamy 1997. Food Facts and Principles. New Age Publ. Potter N & Hotchkiss JH. 1996.
- 11) Food Science. 5th Ed. AVI Book Van. Potty VH & Mulky MJ. 1993.
- 12) Food Processing. Oxford & IBH. Srilakshmi B. 2002.
- 13) Nutrition Science. New Age Publ. Swaminathan MS. 1993.
- 14) Food Science and Experimental Foods. Ganesh & Co.

SPT-3.3.2 Food Biotechnology

(4 Credits 64 Hr)

Unit I:

16 Hr

Prospectus of biotechnology- Definition, scope and applications. Concept of genetic engineering and molecular cloning. Plant and animal culture, transgenic plants, application of genetic engineering in food science and technology. Genetically modified foods – concept, types and application. Application of biotechnology in food. Basic principles of molecular biology and biotechnology:

Introduction to Genetics, Mendelian genetics, Population & Evolutionary genetics, Gene Mapping. Microbial gene transfer mechanisms, Mutation, Types of mutations, Molecular mechanism of mutations, practical applications,

Unit II:

16 Hr

Traditional applications of food biotechnology - Fermented foods: eg dairy products, oriental fermentations, Biotechnological production of malt, chese, energy drinks, alcoholic beverages, and food ingredients. Health benefits of fermented foods. Types of fermented foods and importance of food fermentation in food preservation and nutritional enhancement. Biotechnological production of vitamins, flavonoids as food additives.

Unit III:

16 Hr

Starter cultures – types, designing and development, micro encapsulation and packaging, scopes and challenge; Development and formulation of novel products such as probiotic foods. Nutrogenomics - concept, working, significance and relevance. Biosensors and novel tools and their application in food science.

Unit IV:

16 Hr

Ethical issues concerning GM foods; testing for GMOs; current guidelines for the production, release and movement of GMOs; labeling and traceability; trade related aspects; biosafety; risk assessment and risk management. Public perception of GM foods. IPR. GMO Act –2004.

References

- 1) Lopez GFG & Canovas, G.V.B. “Food Science and Food Biotechnology” CRC Press, Florida, USA. 2003.
- 2) Joshi, V.K., and Pandey, A. Biotechnology: Food Fermentation. Vols.I,II. Education Publ. 2002.
- 3) Bains, W. Biotechnology from A to Z. Oxford Univ. Press. 2009.
- 4) Lee, B.H. Fundamentals of Food Biotechnology.VCH. 2006

OEP-3.4 Diet and disease

(4 Credits 64 Hrs)

UNIT I:

16 Hr

Obesity- classification, causative factors (behavioral risk factors), overview of approaches to treatments and interventions. **Diabetes-** Etiology, symptoms, classification, Metabolism, early diagnosis, Short term and long term complications and management. **Cardiovascular disease** - etiology, incidence, symptoms, risk factors, congestive heart failure and Dietary management. Hypertension- types, symptoms and role of minerals in the diet

UNIT II:

16 Hr

Diseases of Liver, Gall bladder & Pancreas-Hepatitis, (A, B, and C), Cirrhosis, effect of alcohol on liver, Gall stones, pancreatitis-Causes, symptoms and dietary management.

UNIT III:

16 Hr

Renal disease - Nephrotic syndrome, Acute and Chronic renal failure principles of dietary management. Dialysis- types

UNIT IV:**16 Hr**

Gastrointestinal diseases/disorders –Gastritis, Peptic ulcer and duodenal ulcers. Diagnostic, diarrhoea, constipation, diverticular disease and Irritable Bowel Disorder.

References

- 1) Rolfes and Whiney Understanding normal and clinical nutrition
- 2) Katz, David L.; Friedman, Rachel S.C., Nutrition in Clinical Practice: A Comprehensive, Evidence-Based Manual for the Practitioner, 2nd Edition
- 3) Width, Mary; Reinhard, Tonia, Clinical Dietitian's Essential Pocket Guide, The: Essential Pocket Guide, 1st Edition
- 4) Robinson and Lawler, Normal and therapeutic nutrition.
- 5) Srilakshmi, Dietetics.

CPP-3.5 Clinical nutrition and dietetics lab**(2 Credits)**

- 1) Quantitative test – Urine analysis : Creatinine, Urea, Sugar.
 - 2) Dietary management in Fever, Typhoid, Burns, Diarrhea, Malnutrition, Obesity, □ Diabetes mellitus, Peptic ulcer, Constipation
- Maintaining a ready reckoner of samples prepared in the lab

CPP-3.6 Community nutrition and statistics Lab**(2 Credits)**

- 1) Assessment of nutritional status in the community
- 2) Planning and conducting diet survey in a community (different age groups and socioeconomic status may be included)
- 3) Planning and organizing nutrition education programs in the community
- 4) Processing of data – data entry using statistical package and formulation of tables
- 5) Application of statistical methods- mean, frequency, SD, chi- square and t- test
- 6) Interpretation of results and preparation of reports using different graphical and tabular presentation

SPP3.3.1 Food technology and processing lab**(2 Credits)**

- 1) Evaluation of different packaging materials
- 2) Applications of Nanoparticles
- 3) Thermal processing – sterilizing tomato juice in bottles
- 4) Shelf life extension experiments
- 5) Industrial visits to food processing units
- 6) Determination of physical and chemical changes during freezing
- 7) Nutritional changes of food during food processing
- 8) Determination of changes occurring at the time of thawing
- 9) Estimation of freezing point of different solids/ liquid and semi solid foods
- 10) Physical changes during the evaporation and drying

SPP3.3.2 Food biotechnology lab**(2 Credits)**

- 1) Isolation of DNA from plant cell and bacteria
- 2) Isolation of Ti plasmid from *Agrobacterium tumefaciens* and plasmid from *E. coli*

- 3) Restriction digestion of plasmid DNA and plant genomic DNA
- 4) Preparation of competent *E. coli*
- 5) Transfer of plasmid DNA into intact *E. coli* by transformation process
- 6) Preparation of callus
- 7) Differentiation of callus into rooting and shooting
- 8) Micropropagation
- 9) Agrobacterium mediated gene transfer in callus (Gus gene)

OEP-3.4 Diet and disease

(2 Credits)

- 1) Estimation of glucose
- 2) Estimation of creatin
- 3) Abnormal constituents of urine
- 4) Assay of marker enzymes AST, ALT, alkaline phosphatase
- 5) Determination of albumin, globulin in urine samples
- 6) Cholesterol estimation

Semester IV

CPT-4.1 Clinical nutrition and dietetics-II

(4 Credits 64 Hr)

UNIT I:

(16 Hr)

Dietary management of liver disorders, Functions of liver, agents for liver damage, hepatitis, cirrhosis, hepatic encephalopathy, hepatic coma, cholecystitis, cholelithiasis, acute and chronic pancreatitis

UNIT II:

(16 Hr)

Diet in renal diseases, Functions of kidney, glomerulonephritis, nephritic syndrome, acute and chronic renal failure, dialysis, urolithiasis and renal calculi, uremia, urinary tract infections

UNIT III:

(16 Hr)

Diet in cardio vascular diseases and hyper tension, Clinical effects and risk factors, role of fat in the development of atherosclerosis, myocardial infarction, congestive heart failure, coronary bypass surgery, hyperlipoproteinemia, hyper cholesterolemia, hyper tension and factors

UNIT IV:

(16 Hr)

Dietary management in cancer and other diseases, Risk factors and symptoms, nutritional problem of cancer therapy, dietary management and nutritional requirement, role of food in prevention of cancer, eating problems in cancer and nutritional therapy, dietary management, immunity prevention and control. Physiological changes and dietary management of AIDS. Inborn errors of metabolism: causes, consequences and dietary management of phenyl ketonuria, fructosemia, galactosemia, maple syrup urine disease.

References

- 1) Robinson C. H, Normal and Therapeutic nutrition- Oxford & IBH Publishing Co. Calcutta.

- 2) Bedi Y. P., Public Health and Hygiene- Atm ram & sons, Kashmere gate, Delhi.
- 3) Bamji M. S., P. N Rao & Reddy- Textbook of Human Nutrition –Oxford & IBH Publishing Co. PVT Ltd.
- 4) SR Williams, RS Worthington, Introduction to Nutrition throughout the life cycle
- 5) Gopalan C., Combating under Nutrition – Basic issues & Practical Approaches, NFI Publications .
- 6) Garrow J S, James WPT and Raiph, A(2000), Human Nutrition & Dietetics, 10th ed., Churchill Livingstone
- 7) Mahan, L. K and Escott Stump. S. (2008), Kraus’s Food & Nutrition Therapy 12th Ed.
- 8) Anderson L, Dibble, Turkki PR, Mitchell HS & Rynbergen HJ. 1982. Nutrition in Health and Disease. Saunders- Elsevier
- 9) Khader V, Sumathi S & Manorama R. 1998. Clinical Nutrition. Hoeber Medicalk Division.
- 10) JB Lippincott. Bamji MS, Rao NP & Reddy V. 1999. Text Book of Human Nutrition. Oxford & IBH. FAO/WHO/UNU 1985.
- 11) Swaminathan MS. 1985. Modern Nutrition in Health and Disease. Williams & Wilkins.
- 12) Shills ME, Olson JA, Shike M & Ross AC. 1999 Normal and Therapeutic Nutrition. Macmillan.
- 13) Robinson, Lawler, Chenoweth & Garwick, 1987.
- 14) Shills ME & Young VR. Normal & Therapeutic Nutrition. 17th Ed. Macmillan Publishing Co. Modern Nutrition in Health & Disease 7th Ed.
- 15) Stanfield PS,. Lea & Febiger. Hui YH 1992& American Dietetics Association

CPT-4.2 Food Preservation

(4 Credits 64 Hr)

UNIT I:

(16 Hr)

Low temperature processing and storage: Chilling, cryogenic chilling, chill storage, freezing, cryogenic freezing, frozen food storage, freeze drying, changes in food during freezing, various types of freezers (tunnel types, fluidized bed, airblast etc.)

UNIT II:

(16 Hr)

High temperature processing: Drying , dehydration, solar drying, mechanical driers, heat processing using hot oil (frying, shallow frying, deep fat frying), heat sterilization, pasteurization and its types and advantages, heat processing using hot air, baking, effect of heat on foods (texture, flavor, aroma, colour and nutritive value).

UNIT III:

(16 Hr)

Irradiation: Irradiation of foods, types and sources of irradiation, effects or impacts of radiation on foods constituents, hurdle technology, irradiation of packaging material, application of irradiation on foods, dosimetry, health consequence of irradiated food.

UNIT IV:

(16 Hr)

Preservation by chemicals and high concentration: Types and mode of action of organic and inorganic preservatives, antibiotics, antioxidants, anti-browning, cleaning, sanitizing and fungicidal agents. Sugar concentrates- general principles and methods of preparation of jam, jellies and marmalade, crystallized and glazed fruits, preserves, squashes and syrups. Theory of gel formation. Salt concentrates- general principle, role of ingredients, preparation of sauerkraut, dill and common Indian pickles.

References

- 1) Desrosier N W & Desrosier JN, The Technology of Food Preservation- AVI Publication
- 2) Potty VH. & BM J Mulki Food Processing Oxford & IBH Publications
- 3) Swaminathan MS Food Science & Experimental Foods– Ganesh & Co

- 4) Srilakshmi B, Food Science New Age International publication
- 5) Modern Processing, PACKAGING & Distribution System for Food, AP Frank, AVI Van nonstand Reinhold.co.

SPT-4.3.1 Food fortification and sport nutrition

(4 Credits 64 Hr)

UNIT I:

(16 Hr)

Food fortification – Needs, objectives, principles and rationale, selection and basis of fortificants. Types of fortification. Health benefits of fortification, Selection of nutrients for fortification, Levels to be added, Characteristics of fortificants and method of fortification. Technology of fortifying cereal products: Fortification methods. Fortification premixes, Design and composition of premixes and quality control. Fortification of bread, pasta, noodles, biscuits, and breakfast cereals.

UNIT II:

(16 Hr)

Micronutrient fortification of snack products, merits and demerits of fortification, choice of products and selection of micronutrients, Setting level of fortification, Safety limits, Technological and cost limits, Challenges in fortifying snack products, Nutrient interaction and bioavailability. Sugars: Fortification with iron and vitamin A, Premix formulation, Fortification level, Packaging. Milk: Fortification with vitamin A, technology and levels. Oils: Fortification with vitamin A, Rationale of vitamin A fortification, Stability of vitamin A in oil during storage and cooking, Efficacy and safety of vitamin A added to oil, Technology of fortifying, Packaging

UNIT III:

(16 Hr)

Nutrition in sports: Sports specific requirements- Importance of carbohydrate loading, pre game and post game meals, Diets for persons with high energy requirements, stress, fracture and injury Interrelationship of physical fitness and health. Significance of physical fitness and nutrition in prevention and management of weight control regimes. Ideal body composition for different sports and events. Nutritional guidelines for maintenance of health and fitness..

UNIT IV:

(16 Hr)

Dietary supplements and Ergogenic aids: . Effect of specific nutrients on work performance and physical fitness. Nutrients that support physical activity, Mobilization of fuel stores during exercise. Fluid, carbohydrate and electrolyte requirements. Use of different nutrigenic / ergogenic aids and commercial supplements, Sports drinks, sports bars etc. Guidelines for selection of ergogenic aids

References

- 1) Lindsay Allen, Bruno de Benoist, Omar Dary and Richard Hurrell (Eds.) 2006 Guidelines on food fortification with micronutrients: World Health Organization and Food and Agriculture Organization of the United Nations
- 2) Stakeholder consultation on Regulation for staple food Fortification: 15 April 2011: National Institute of Nutrition and Indian Council of Medical Research, Hyderabad: working paper
- 3) www.who.int/nutrition/.../guide_food_fortification_micronutrients.pdf
- 4) PATH: Ultra Rice technology. http://www.path.org/projects/ultra_rice.php [Accessed February 25, 2011].
- 5) www.a2zproject.org/node/10
- 6) www.fortaf.org

- 7) www.a2zproject.org/node/10
- 8) Falkner F & Tanner JM.. Human Growth - Principles and Prenatal Growth. Vol. I Bailliere Tindall. 19 Falkner F & Tarnner JM. 1980.
- 9) Nutrition - An Integrated Approach. John Wiley & Sons.
- 10) Passmore R & Eastwood MA. 1986. Human Growth Methodology. Ecological, Genetic, and Nutritional Effects on Growth. Vol. III. Plenum Press.
- 11) Pike RL & Brown ML.1988. Human Nutrition & Dietetics. ELBS Churchill Livngstone.

SPT-4.3.2 Nutritional Systems Biology & Research methodology (4 Credits 64 Hr)

I: Nutrigenomics:

16 Hr

Brief introduction of gene and gene expression. Genetics and metabolism, Scope and Importance of nutrigenomics, Methods of studying genomics and nutrigenomics process. Methods to study influence of nutrient on gene expression, Nutrigenomics approaches to unraveling physiological effects of complex foods, Gene polymorphism and transport of fatty acids. Nutrients/ nutraceuticals interaction on gene expressions and disease state. Gene-nutrient interaction Nutrient regulated gene expression and genetics of nutrient metabolism. Modulating the risk of obesity, diabetes, cardiovascular disease, cancer and malnutrition through nutrigenomics. Nutritional genomics and healthcare practice.

II: Nutriproteomics:

16 Hr

Brief introduction to proteomics and nutriproteomics, Methods to study proteomics and nutriproteomics. Details of technique involved in Proteomics study process. Methods of proteomics analysis. Application of bioinformatics tools and software used in proteomic analysis. Structural proteomics, functional proteomics and their applications. Nutrients and proteomics, nutrient deficiency and proteomics, food allergens and proteomics, proteomics approach to study inflammation and antiinflammatory nutrients and metabolites. Proteomics profiles in obesity, diabetes, cardiovascular disease, cancer and micronutrient and energy deficiency.

III: Nutrimetabolomics:

16 Hr

Introduction to Metabolism. Study of metabolites, nutrients, nutraceuticals, antinutrients, allergens, toxic nutrients. Review of intermediary metabolism, integration of metabolism. Influence of nutrients on blood, tissue and urine metabolomics. Methods to study metabolomics process. Methods to detect metabolites in biofluids and tissues. Metabolomics investigation of foods and their applications. Food allergens and individual metabolomics. Applications of metabolomics.

IV: Research Methodology

16 Hr

Research objectives and types, understanding scientific problem and its relevance to society. Selection of research problem and methodology design. Research methodology and research methods. Criteria of good research- Concepts and features of good research design. Case studies on Population based and experimental nutrition research. Literature survey. Research process. Strategies for preparation of research proposal. Generation of scientific data and its effective communication. Plagiarism, fabrication and falsification of data. Indexed, high impact, cited and non-indexed journals, open indexed v/s free publishing journals, Structure and component of scientific report- **types of report- technical reports, dissertation and thesis.** Fitting research data into letters to the editor, short communication, full length article, monograph and review. Organizing scientific data for poster and oral presentation. Data protection-principles of copyright, IPR, patent and patent laws.

Reference Books:

1. European text book on ethics in research Luxembourg: Publications office of the European Union, 2010, ISBN 978-92-79-17543-5
2. Research Methodology in Medical and Biological Sciences. Eds. PetterLaake, Haakon Brein Benestad, and BjØrenReino Olsen. Academic Publishers ISBN: 978-0-12-373874-5
3. Research Methodology Methods and Techniques. Ed. C R Kothari, New Age International (P) Ltd., Publishers ISBN (13): 978-81-224-2488-1
4. A Guide to Research Ethics, University of Minnisota Centre for Bioethics, 2003
5. An Introduction to Research and Research Methods. University of Bradford, School of Management

CPP-4.4 Clinical nutrition and dietetics-II Lab

(2 Credits)

Dietary management as per the biochemical parameters (on any 2 calories) / (mild, moderate and sedentary)

Liver damage, Hepatitis, Cholecystitis

Chronic pancreatitis, Chronic renal failure, Renal calculi

Glomerulonephritis, Atherosclerosis, Congestive heart failure

Hypertension, Phenylketonuria, Lactose intolerance

CPP-4.5 Food Preservation Lab

(2 Credits)

Food preservation techniques (use of different techniques in product formulation and analysis of product for quality standards).

1. Sun drying and dehydration-cereals, legumes, vegetable.
2. Preservation with sugar-jams, jelly, preserves, etc.
3. Preservation with salt, oil, vinegar-pickling.
4. Preservation of foods using chemicals –tomato ketchup, squash.

SPT-4.6.1 Food fortification and sport nutrition

(2 Credits)

1. Food-food fortification Devise experiments based on locally available foods
2. Preparation of malt for enrichment of micronutrient status and antioxidants
3. Fortification of vitamin C, A and E in ready to eat foods
4. Fortification of iron and zinc in cereal and millet foods
5. Fortification of protein (supplementation) in different foods
6. Preparation of malt drink as energy food
7. Preparation of glucose based instant energy drink
8. Preparation of creatine supplements for sport drink

SPT-4.7.2 Metabolomics dry Lab

(2 Credits)

CPDP 4.7 Core Paper Dissertation Project

(6 Credits)

Project work to be carried out experimentally or based on nutritional surveys or both and prepare a dissertation consisting of Abstract, Introduction, materials methods, results, discussion, conclusion, references and summary