

M.SC FOOD SCIENCE AND NUTRITION

SYLLABUS

(2023 onwards)



**P. G. DEPARTMENT OF
FOOD AND NUTRITION**

M.Sc., Food Science and Nutrition

Programme Outcomes

Vision

The Department seeks to function with mutual love, social commitment to educate and engage students in research and extension activities to serve the community

Our Mission

- Provide in-depth knowledge on nutrients so as to rule-out disorders and diseases at cellular and systemic levels, ultimately promoting good health.
- Ignite curiosity and inquiry on the interrelationship between theoretical knowledge obtained with field exposure, leading to innovative discoveries and application of knowledge in the areas of nutrition, as well as food product development.
- Transform the academic knowledge obtained to social benefits, thus helping the nation in eradication of malnutrition and improving the quality of life of citizens.
- Achieve academic excellence in the area of food and nutrition, making them full-fledged professionals in the area of research, teaching, clinical and community nutrition, dietetics, food science and food safety and quality control.

Programme Outcomes

On Successful completion of M.Sc Food Science and Nutrition Program, the Post Graduates will be able to:

Knowledge

PO1 Apply the principle of science and technology thus understanding the complex and heterogeneous aspect of food in treating diseases, as well as inventing new innovative food products.

PO2 Evaluate, adopt and apply best practices relating to health, safety, quality, food industry and client satisfaction in the field of Food Science and nutrition.

PO3 Appraise the concepts on systematic research in Food Science and Nutrition, Analysis of Nutrients, Nutritional Assessment and Diet Planning to combat malnutrition.

Attitude

PO4 Develop critical thinking, decision making attributes and aesthetic skills to enhance professional competency by updating and applying emerging trends and technology in the areas of clinical nutrition, dietetics, community nutrition and food science.

Skills

PO5 Deliberate critically and apply appropriate contemporary Research techniques, resources and demonstrate skills, attitudes in development of novel food products.

PO6 Apply the concept of nutraceuticals in treating diet-related diseases and metabolic disorders, as well as bring forth cost-effective innovative health drinks and sport drinks, which are the need of the hour.

PO7 Face the global challenge of meeting the demand for skilled professionals in the area of nutrition, dietetics and food science by fostering entrepreneurial skills, and enabling the pursuit of higher education, research and career in the area of food science and nutrition.

PO8 Implement technical skills of health behaviour, clinical judgement and decision making skills in validating the data of vulnerable groups, organoleptic evaluation, quantitative, qualitative evaluation of food products, evaluating the nutritional status of individuals, communities and their response to nutrition intervention.

Ethical and Social Responsibility

PO9 Develop management skills and entrepreneurial skills in the field of Food Science and Nutrition and the ability to work effectively and to live responsibly in a global context of cross-cultural life and capability, to value human diversity and lead life of timeless learning and endless opportunities.

Programme Specific Outcomes

On successful completion of M Sc. Food Science and Nutrition program, the Post Graduate student will be able to

Intellectual Skills

PSO1 Obtain skills in the fields of food science and nutrition and to provide innovative solutions to problems related to the food processing industry, as well as the field of clinical nutrition.

Practical Skills

PSO2 To develop skill and necessary confidence to work in hospitals /food processing industries with the ultimate goal of ensuring safe food and good health.

PSO3 Apply knowledge of advance Food science and Nutrition, to develop practical skills of management of dietary departments in various organizations and food production units.

Transferable Skills

PSO4 Apply the principles of advanced food science to produce innovative food products with value addition for commercial value to the benefit of the individual, firm and society honing the entrepreneur skills in students.

MSC FOOD SCIENCE AND NUTRITION 2023

Sem.	Part	Course	Course Title	Course Code	Hours / week	Credits	Marks		
							CIA	ESE	Total
I	Part A	Core Paper I	Advanced Food Science	P23FS101	7	5	25	75	100
		Core Paper II	Advanced Human Physiology	P23FS102	7	5	25	75	100
		Core Practical I	Advanced Food Science Practical	P23FS1P1	6	4	40	60	100
		Elective I	Macronutrients	P23FS1:A	5	3	25	75	100
			Food Product Development	P23FS1:B					
		Elective II	Food Processing and Technology	P23FS1:C	5	3	25	75	100
			Nutrition in Critical Care	P23FS1:D					
				30	20				
II	Part A	Core Paper III	Research Methods in Nutrition	P23FS203	6	5	25	75	100
		Core Paper IV	Advanced Dietetics	P23FS204	6	5	25	75	100
		Core Practical II	Advanced Dietetics Practical	P23FS2P2	6	4	40	60	100
		Elective III	Nutritional Biochemistry	P23FS2:A	4	3	25	75	100
			Sensory Evaluation	P23FS2:B					
		Elective IV	Perspective of Home Science	P23FS2:C	4	3	25	75	100
			Nutraceuticals and Functional Foods	P23FS2:D					
		NMEC I	Detection of Food adulterants	P23FS2E1	4	2	25	75	100
					30	22			
III	Part A	Core Paper V	Micronutrients	P23FS305	6	5	25	75	100
		Core Paper VI	Techniques in Food Analysis	P23FS306	6	5	25	75	100
		Core Paper VII	Performance Nutrition	P23FS307	6	5	25	75	100
		Core Practical III	Food Microbiology Practical's	P23FS3P3	6	4	40	60	100
		Elective V	Food Microbiology	P23FS3:A	3	3	25	75	100
			Food Packaging	P23FS3:B					
				NMEC II	Food Preservation	P23FS3E2	3	2	25
		Internship	Internship / Industry Activity	P23FS3I1	--	2	100	--	100
					30	26			
IV	Part A	Core VIII	Public Health Nutrition	P23FS408	6	5	25	75	100
		Core Practical IV	Food Analysis Practical's	P23FS4P4	6	5	40	60	100
		Core Project	Core Project with Viva Voce	P23FS4PJ	8	7	40	60	100
		Elective VI	Advanced Food service Management	P23FS4:A	4	3	25	75	100
		SEC	Professional Competency in Food and Nutrition	P23FS4S1	4	2	100	--	100
		Extension Activity	Extension Activity	P23ETA41	--	1	--	--	--
		Part B	VLO	The Big Picture	P23VLO41	2	2	100	--
	Flying High		P23VLO42						
					30	25			
				Total Credits :		91+2			

Core Theory	8
Core Practical	4
Elective	6
NMEC	2
Internship	1
SEC	1
VLO	1
Extension Activities	1
Project	1

Total Course 25

Total Credits 91+2

NMEC 1. Detection of Food Adulterants

2. Food Preservation

Course Type :Core Theory	Course Title : Advanced Food Science
Semester : I	Code : P23FS101
Credits : 5	Total Hours : 7

Course Outcomes

On completion of this course the students will be able to:

	Course Outcomes	Level	Unit
CO1	Illustrate the role of physio-chemical changes in food science for the formation of various compounds	K2	I
CO2	Identify the properties of various starch and sugars and quality of flour	K3	II
CO3	Evaluate the physio-chemical changes of vegetable and animal protein	K6	III
CO4	Evaluate various properties and changes of different fats and oils	K5	IV
CO5	Analyze the different types of pigments and physio-chemical changes of plant foods	K4	V
CO6	Determine the structural, functional and physio-chemical characterization of food components	K5	I to V

Syllabus

UNIT I

- 21 Hours

A. Properties of Food- Food nutrients, solids, solutions and colloids, Solutions-Physical properties of solutions, classification of foods based on viscosity characteristics. Solutes-chemical properties, Food dispersion: Colloids- Types of colloid and properties of colloids and rheology of food dispersions; Structure, formation and stability of gels, sols, emulsion, and foams.

B. Starch - Sources, Structure and composition of starch; Properties and characteristics of food starches; Modified food starches-Structure and composition, Effect of heat on food starch properties, gluten formation in wheat flour, influencing factors[gluten], gelatinization, gelation and retrogradation, dextrinization and factors affecting gelatinization.

UNIT II

-21 Hours

A. Proteins-Structure and composition, Classification and properties of proteins; Effect of heat on physio-chemical properties of proteins; Role of proteins in food products; Texturized vegetable protein, protein concentrates.

B. Enzymes: Classification and its nature; Mechanism of action; Factors influencing enzyme activity; Role of enzymes in food products; Immobilized enzymes and its application in food industries.

UNIT III

- 21 Hours

A. Fats and oil -Structure, composition and properties of fats and oil; storage of fat, characteristics [shortening, plasticity, flavor, retention of moisture, melting point, optical activity, color, specific gravity], Hydrogenation, winterization, flavor reversion, smoking point, Rancidity-Types, Mechanism and prevention; Role of fat/oil in food products; Fat substitutes.

B. Sugar and sugar products-Types of sugar, Types of granulated sugar, Physical and chemical properties, Sugar products -Types of honey, Jaggery, corn syrup, various forms of sugar used in cookery and Crystallization of sugar.

UNIT IV

-21 Hours

A. Milk components- water, carbohydrate, milk fat, milk protein, minerals and other components in milk, Physiochemical properties of milk, Effect of physical and chemical factors on milk components [Effect of heat, protein, factors affecting coagulation, casein coagulation, minerals, Non-enzymatic

browning], [Effects of acid], Effects of enzymes-renin, fermented and non-fermented milk products

- B. Egg-proteins** in Egg, microscopic structure of egg, characteristics [color, size], Nutritional qualities, quality check, functional properties- foaming, factors affecting foam formation.

UNIT V

-21 Hours

- A. Food additives-** Definition, different food additives and need for food additives. Flavor compounds in vegetables, fruits and spices; Effect of processing on food flavors; Role of colors and flavors in food products.
- B. Sweeteners-** Properties, Artificial and Natural sweeteners and role of sweeteners in food industry.

UNIT VI Topics for self-study

Advances in Dairy Ingredients-Advances in Fermented Foods and Beverages
Improving Quality, Technologies and Health Benefits-Advances in Flavours
and Fragrances - From the Sensation to the Synthesis

Text Books:

1. Srilakshmi B. Food Science. New Age International (P) Ltd. Publishers. (2015).
2. Reddy S.M. Basic Food science and technology. New Age International publishers. Avantina Sharma (2017).
3. Text book of food science and Technology. CBS Publisher and distributes ltd. 3rd Edition. (2015).
4. Swaminathan A. Handbook of Food and Nutrition, Bangalore press. .(2018)
5. Serpil Sahin and Servet Gulum Sumnu Physical properties of Foods. Springer publications 2006).
6. Brown. A: Understanding Food-Principles and Preparation; 2nd edition, Thomson Wadsworth. 2004.
7. Potter, N. and Hotchkiss HJ, Food Science, 5th edition, CBS Publisher, 2007.

References:

1. Gerard L. Hasenhuettl , Richard W. Hartel. Food Emulsifiers and Their Applications. Springer publications. 3rd edition. (2019)
2. Vickie.A. Vaciavik. Essentials of Food science. Springer publications. 5th edition. (2021).
3. .Swaminathan Advanced text book of Food and Nutrition. volume-2. Bapco publications. .(2015).
4. Eskein Biochemistry of Food. Elsevier publications. .(2012).
5. Lyn O brien Nabors. Alternative Sweeteners. Taylor and Francis publications. (2001).
6. Janet D. Ward and Larry Ward.(2006). Principles of Food Science. Stem Publishers. 4th Edition.

Elearning Resources:

www.fao.org www.wfp.org. www.foodrisk.org., <http://www.fsis.usda.gov/>
<https://www.fda.gov/food>

Course Type : Core Theory II	Course Title : Advanced Human Physiology
Semester : I	Course Code : P23FS102
Credits : 5	Hours / Week : 7

Course Outcomes:

After completion of this course the students will be able to

	Course Outcomes	Level	Unit
CO1	Identify the functions of basic units of the human system -cell system and nervous function.	K3	I
CO2	Explain the role of Endocrine system and Sense organs system in the role of sense organs and nervous, voluntary and involuntary control of various functions.	K2	I,II, III
CO3	Explain the role of circulatory system in carrying the nutrients throughout the body and crucial role of heart and lungs in maintaining bodily functions.	K5	IV
CO4	Explain the role and importance of blood in human health.	K4	III
CO5	Analyze the human skeletal and immune system and its role, importance of body .	K5	V
CO6	Develop competency in analyzing the correlation between health, disease, and physiology.	K5	I,II,III, IV,V

Syllabus

UNIT- I Cell

- 21 Hours

- Structure and Function.
- Transportation across cell membrane.
- Cell theory and Cycle. Difference between Meiotic and Mitotic cell.
- Stem cells- types and functions.

Tissue

- Structure and Function.

UNIT II Blood

-21 Hours

- Composition & Functions
- Blood Group – ABO System & Rh factor.
- Blood Coagulation.

Heart

- Structure & Function of Heart and Blood Vessels.
- Systemic & Pulmonary circulation
- Cardiac cycle and Conduction.
- Heart rate and Cardiac output. ECG.
- Blood pressure & their regulations.

UNIT III Respiratory System

-21 Hours

Structure and function.

Gas Laws pertaining to Gas Exchange (Meaning only)-Henry's Law of Partial Pressure, Boyle - Mariotte's Law of Volume and Pressure, Dalton's Law of Partial Pressure, Charles's Law of Ideal Gas Equation and Fick's Law of Diffusion.

Mechanism of respiration.

- Circulation and Exchange of respiratory gases. Internal and External Respiration. Chloride shift.
- Definitions of Lung volumes and Lung capacities
- Ventilation and Artificial Respiration.

Immunity-

Definition and types Innate and Acquire immunity.

Endocrine System

- Hormones and its type.
- Syndromes resulting from hypo and hyperactivity of Pituitary, Thyroid, Adrenals and Pancreas.

UNIT -IV Gastrointestinal System

- 21 Hours

- Structure and function of GI tract and its accessory organs.
- Digestion and absorption of Carbohydrates, Proteins and Fats.

Reproductive System

- Roll of hormones in reproduction and Lactation.
- Menstrual Cycle and Menopause.
- Invitro (I V) fertilization
- Spermatogenesis.

UNIT V Nervous System

- 21 Hours

- Structure and Function of Neuron. Afferent and Efferent Nerves.
- Conduction of Nerve Impulse- Synapses, Neurotransmitters, Summation and Action Potential.
- Sympathetic and Parasympathetic nervous System.
- Cerebrospinal fluid (CSF) – composition and function.
- Blood-brain barrier (BBB).
- Electroencephalogram (EEG)

Excretory Systems

Renal system

- Organs in the Urinary System.
- Structure and functions of Nephron.
- Juxtaglomerular Cell.
- Mechanism of formation of urine,
- Role of kidney to regulate Blood pressure, Water, Electrolytes and Acid Base Balance.

Skin

- Structure and function.
- Regulation of temperature of the body.

VI Topic for Self Study:

Immunity – innate and acquired immunity. Heart lung machine. Renal failure – Kidney transplantation and artificial kidney dialysis and home remedies of detoxification diet,. Neurotransmitters – dopamine, serotonin, endorphins, oxytocin.

Text Books

1. Sembulingam & Prema Sembulingam K, Essentials of Medical Physiology. Jaypee publications. Eighth edition. (2019),
2. Waugh A, Ross and Wilson Anatomy and Physiology in Health and Illness. Elsevier publications. 13ed. (2018)..Chatterjee, CC Human Physiology. CBS publishers. 13 ed. 2020
3. Indu Khurana Medical Physiology for Undergraduate Students. Elsevier Publication. 2 Edition. 2020.
4. Ganong, W.F. *Review of Medical Physiology*, 12" Edition, Lange Medical Publication. 1985
5. Moran Campell E.J., Dickinson, C.J., Slater, J.D., Edwards, C.R.W. and Sikora, K. *Clinical Physiology*, 5" Edition, ELBS, Blackwell Scientific Publications., 1

6. Guyton, A.C. *Function of the Human Body*, 4th Edition, W.B. Sanders Company, Philadelphia. 1985

References Books

1. Wilson, K.J.W. and Waugh, A. *Ross and Wilson Anatomy and Physiology in Health and Illness*, 8th Edition, Churchill Livingstone. 1996
2. McArdle, W.D., Katch, F.I. and Katch, V.L. *Exercise Physiology. Energy, Nutrition and Human Performance*, 4th Edition, Williams and Wilkins, Baltimore.,1996
3. Jain, A.K.: *Textbook of Physiology*. Vol. I and II. Avichal Publishing Co., New Delhi.,1996
4. Best and Taylor, “*The Physiological Basis of Medical Practice*”, 13th Edition, Saunders Company, 2011
5. Chaudhri, K., “*Concise Medical Physiology*”, 7th Edition, New Central Book Agency (Parental) Ltd., Calcutta, 2016.
6. Chatterjee C.C., “*Human Physiology, Volume I & II*”, 11th Edition, CBS Publishers, 2017.

E Learning Content

<https://youtu.be/MZDy0RvA52Y>-Osmosis

<https://youtu.be/TgcyiVQnVBs>- Respiratory

system <https://youtu.be/44B0ms3XPKU>-

nervous system

Course Type: Core Practical - I	Course Title: Advanced Food Science Practical
Semester : I	Code : P23FS1P1
Credits : 4	Hours / Week : 6

Course Outcomes

On completion of this course the students will be able to:

	Course Outcomes	Level	Unit Covered
CO1	Explain the effect of heat on the consistency of various sweets	K2	I
CO2	Apply the principles of fat cookery and identify the factors affecting absorption of fat in foods	K3	II
CO3	Examine the effect of acid and alkali on the pulse cookery	K4	III
CO4	Assess the role of various parameters such as pH and heat on the pigments present in vegetables	K5	IV
CO5	Determine the factors affecting the tenderness of meat and the role of heat in coagulation of egg and the factors that affect egg cookery	K5	V
CO6	Prepare variety of recipes using different methods of cooking, stages, effect of acid, alkali etc.,	K6	VI

Syllabus

UNIT -1

I Sensory method –

- Analysis of taste sensitivity-Threshold test Duo –Trio test

- Multiple sample difference

II Starch

- Microscopic structure and gelatinization.
- Factors affecting gelatinization –sag test.
- Gluten formation

III Pulse

- Factors affecting cooking quality

IV Fruit

- Enzymatic browning Pectin test
- Firmness of gel

V Vegetable

- Various method of cooking fat soluble and water-soluble pigment.

VI Milk

- Detecting the presence of starch, soda, starch, urea in milk sample. pH of milk sample.
- Effect of acid on milk Maillard reaction.

VII Sugar

Relative sweetness of sugar- sucrose, maltose, lactose, fructose, dextrose, glucose, artificial sweeteners Stages of sugar cookery

Effect of dextrose, jaggery, honey and cream of tartar on sucrose.

VIII Fats and Oil

- Smoking point – Groundnut oil, coconut oil, Gingelly oil, Olive oil, Vanaspati, Ghee, Refined Sunflower oil, Rice bran oil.

- Cooking temperature and fat absorption- – Groundnut oil, coconut oil, Gingelly oil, Refined Sunflower oil, Rice bran oil.

IX Physical Properties

- Thousand grain weight
- Thousand grain volume
- Hydration capacity
- Hydration index
- Swelling capacity
- Specific gravity
- Seed displacement test
- Viscosity - Line spread test, Viscometer.
- Adulteration

Text Books:

1. Srilakshmi B. Food Science, New Age International (P) Ltd. Publishers. (2015).
2. Potter N. and Hotchkiss J.H. Food Science, Fifth ed., CBS Publishers and Distributors, NewDelhi (1996).
3. Avantinasharma Text book of food science and Technology. CBS Publisheres and distributes ltd. 3rd Edition. (2017).
4. Reddy S M. Basic Food science and technology. New Age International publishers. 2nd edition. (2015).

References:

1. Swaminathan A. Food Science And Experimental Foods, Ganesh And Company Madras. 3rd edition. (1979)
2. Bennion, Marion and O. Hughes Introductory Foods. Edi: mac millian N. Y. 1st edition. (2001).
3. Eskein . Biochemistry of Food. Elsievier publications, (2012).
4. Desrosier, N.W. and James N. Technology of food preservation.AVI Publishers. (2007).
5. Manay, S. and Shadaksharamasamy,.Food: Facts and Principles, New Age International Publishers, New Delhi. 1st edition. (2004)

E-Learning Resources

<http://www.fao.org/3/V5030E/V5030E00.htm> <https://fmtmagazine.in/fruits-vegetables-processing-technologies/>

www.fao.org www.wfp.org

[Learn Microbiology with Online Courses and Classes | edX](#)

Course Type : Elective - I Theory	Course Title : Macro Nutrients
Semester : I	Course Code:P23FS1:A
Credits : 3	Total Hours: 5

Course Outcomes

On completion of this course the student will be able to:

	Course Outcomes	K-Level	Unit Covered
CO1	Outline the essentials of nutrients in growth and development of humans	K2	I
CO2	Identify the importance of major nutrients in maintaining human health and leading active lifestyle	K3	II
CO3	Analyze the enhancement of nutritional quality of the diet.	K4	III
CO4	Classify the various types & sources of food borne illness and methods of prevention.	K4	IV
CO5	Explain the role of nutrients in health and diseases.	K5	V
CO6	Plan and provide a best nutrition based services ultimately for the entire society	K5	

Syllabus

UNIT I:

-15 Hours

Energy- Energy content of foods, physiological fuel value, Estimation of total energy requirements (BMR, REE and physical cost of activities) TEE, Energy balance, Basal metabolic rate, total energy requirements, BMR& RMR, Factors affecting BMR, Thermic effect of food. Changes in body weight and body composition with the changing energy balance, Regulation of food intake- role of hunger and satiety centers. Energy balance and obesity.

UNIT II:**- 15Hours**

Carbohydrates – Classification , Therapeutic uses of carbohydrates, sugars in parenteral nutrition. Glycemic index of foods and its uses. Toxic effects of fructose, xylitol and galactose. Sugar alternatives, Role of dietary fiber in health and disease. Role of carbohydrates in health and disease

UNIT III:**- 15 Hours**

Protein – Historical review of protein metabolism, Amino acid patterns in protein & of animals and vegetable origin, critical study of methods of assessment of protein quality. Physiological functions of proteins. Essential Amino Acids, amino acid balance and imbalance, Role of protein in health and disease. Supplementation of individual amino acid.

UNIT IV:**- 15 Hours**

Lipids–Concepts of visible and invisible fats, EFA, SFA, MUFA, PUFA, omega-6 to omega-3 ratios. – sources and physiological functions and their role in health and disease. Adipose tissue – Lipogenesis and Lipolysis, lipoproteins – types and health implication.Storage of body fat, Effects of deficiency. Fat substitutes, Hypo-cholesterolaemic foods – garlic, fiber and plant proteins.

UNIT V:**- 15 Hours**

Water – Sources, Function, Requirement, Distribution of water in the body and Factors influencing distribution of body fluid. Exchange of water in the body. Water imbalance – dehydration- water intoxication, water and electrolyte mechanism – ADH.

UNIT VI: Topic of Self Study

Evaluation of protein quality, supplementary value of proteins, role of macro nutrients in DNA change, deficiency diseases of macro nutrients, food fortification.

Text Books:

1. Satyanarayana, U., & Chakrapani, U, Biochemistry, Book and Allied Pvt. Ltd., Kolkata, 2013.
2. Wardlaw, G. M., Byrd-Bredbenner, C., Moe, G., Berning, J. R., & Kelley, D. S. , *Wardlaw's perspectives in nutrition*. McGraw-Hill, 2013.
3. Williams, S. R., Nutrition and diet therapy. *Nutrition and diet therapy, 2004*.
- 4.Sizer, F., Whitney, E., & Webb, F., Nutrition Concepts and Controversy, Thomas Wadsworth, Australia. 9th edition, 2003.
5. Shils, M. E., Olson, J. A., &Shike, M., Modern nutrition in health and disease. Modern Nutrition in Health and Disease. Eighth edition, Vol I and II. Lea &Febiger Philadelphia, A Waverly Company, 2000.
6. Mahan, L.K., & Stump, S.E., Krause's Food Nutrition and Diet Therapy, 10th edition, W.B. Saunder's company, Philadelphia, 2002.

References:

1. Guthire, H.A., Introductory Nutrition, Tenth edition, C.V. Mosby Company, St. Louis., 2001.
2. Bogert, J.G.V., Briggs, D.H., & Calloway, Nutrition and physical fitness, 11th edition, W.B. Saunders Co., Philadelphia, London, Toronto, 2000.
3. Brown, J.E., Nutrition Now, 3rd edition, Wadsworth Thomson Learning New York, 2002.
4. Toteja, G. S. *Micronutrient profile of Indian population*, Indian Council of Medical Research Publication, New Delhi, 2004.
5. Swaminathan, M., Principles of Nutrition and Dietetics. BAPPCO, 88, Mysore Road. Bangalore, 2002.

6. Jain, J.L., Jain, S., & Jain, N., Fundamentals of Biochemistry, 6th revised edition, S. CHAND & COMPANY, New Delhi, 6th revised edition, 2005.

E- Learning Resources:

1. www.nutrition.gov – Service of National agricultural library, USDA
2. www.nal.usdfa.gov/fnic - Food and nutrition information center
3. www.fantaproject.org- Fanta technical assistance for nutrition
4. <http://dietary-supplements.info.nih.gov> – Officer of dietary supplements, national institute of health.

Course Type: Elective -I Theory	Course Title : Food Product Development
Semester: I	Course Code:P23FS1:B
Credits: 3	Total Hours: 5

Course Outcomes

At the end of the course, the students will be able to:

	Course Outcomes	Level	Unit Covered
CO1	Identify the basic principles and concepts of food product development	K2	I
CO2	Analyze various cultural factors involved in the dietary pattern of various groups.	K4	II
CO3	Discuss the steps involved in product development, portion size, cost calculation and nutritive value calculation.	K4	II, III
CO4	Develop a new food product for different age groups.	K5	IV
CO5	Compare the market structure and develop practical skills in formulating and promoting the food product in a market.	K5	V
CO6	Develop of the global trends in developing entrepreneur skills.	K6	V

Syllabus

UNIT-I Concepts of product development:

-15 Hours

Basic principles and concept of food product development, cultural approach to development of dietary pattern of various groups-language, linguistic, regional, religious (ethnic), Factors involved in food habit alteration,

availability, importance and role of different research and development departments in food production industry.

UNIT-II Market Process

-15 Hours

Steps in product development-material resources based on market demand, standardization methods involved in product development. Portion size and portion control; Calculation of nutritive value and cost of production, shelf life and storage stability evaluation procedure of developed food products.

UNIT-III Formula Development

- 15 Hours

Formulation of new food products for infants, preschool children, adolescents, pregnant and nursing mothers, old age, sports persons, armed sources personnel and therapeutic uses. Selection and training of judges, Development of Score Card and analysis of data, Role of advertisement and Technologies in promotion of new products.

UNIT-IV Government proportion

- 15 Hours

Concept of market and marketing - approaches of study marketing and marketing functions, market structure, marketing efficiency and market integration, Role of Government in promoting agricultural marketing. Market promotion and positioning of food products.

UNIT-V Sanitation:

- 15Hours

Conditions for sale, license and identification and quality processing, conditions for distribution, storage and sanitation, Studying the global market status, Role of export promoting agencies, Economic feasibility of new products.

Unit VI- Self Study

Engineering and Production, Prototyping/Test Marketing, Challenges of Food Product Development, Latest Trends and Innovations

Textbook

1. Sudhir Gupta, "Handbook of Packaging Technology", Engineers India Research Institute, New Delhi 2017
2. Khanaka, S.S., "Entrepreneurial Development", S. Chand and Company Ltd, New Delhi, 2016.
3. Serpil Sahin and ServetGulumSumnu Physical properties of Foods. Springer publications 2006).
4. Brown.A:Understanding Food-Principles and Preparation;2nd edition, Thomson Wadsworth. 2004.
5. Potter, N. and Hotchkiss HJ, Food Science, 5th edition, CBS Publisher, 2007.

References

1. Suja, R. Nair, "Consumer Behaviour and Marketing Research", 1st Edition, Himalaya Publishers, (2014).
2. Hmacfie, "Consumer led Food Product Development", Weedhead Publishing Ltd., UK, (2017)
3. Fuller, Gordon, W., "New Food Product Development", 2nd Edition, CRC Press, Boca Raton, Florida, (2015
4. Schaffner .D,J, Schroder , W.R. "Food Marketing and International Perspectives", Web/McGraw Hill , (2010)

Course Type : Elective -II Theory	Course Title : Food Processing and Technology
Semester: I	Code: P23FS1:C
Credits: 3	Hours/Week: 5

1.Course Outcomes

	Course Outcome	Level	Unit Covered
CO1	Illustrate the concepts and principles of food processing.	K2	I
CO2	Identify the various processed food products from plant and animal sources	K3	II
CO3	Examine the by-products utilization from food processing	K4	III
CO4	Evaluate the systematic knowledge of basic and applied aspects in food processing and technology	K5	IV
CO5	Explain various post-harvest technologies for different food products	K5	V
CO6	Determine the processing of various foods and Post-harvest technologies involved	K5	

Syllabus

UNIT-I Processing of Foods

- 15 Hours

A. Processing: Primary, secondary and tertiary processing, historical perspective, traditional technologies used in food processing. Effects of processing on components, properties and nutritional value of foods.

B. Enzymes in Food Processing: Enzyme- Review of classification, enzyme inhibitors, enzymatic browning.

UNIT-II Cereal Processing and Technology

- 15 Hours

A. Rice: parboiling, milling and pearling; Processing and milling of wheat, maize, barley, oats and rye.

B. Millets: processing of millets

C. Cereal Products: Flours and its quality; Processed products of rice, wheat and maize; By products utilization; breakfast cereals and extrusion; Effect of processing on nutritive value of cereals; changes in physio-chemical properties of cereal starch and protein due to processing.

D. Milling process: Complete milling process, break rolls, reduction rolls, milled products and their nutritive value and applications

E. Pulse Processing and Technology: Dals, flours, protein concentrates, isolates and hydrolysates; By-products utilization; Effect of processing on nutritive value and physio chemical properties of pulses.

F. Nuts and Oil Seeds Processing and Technology: Nuts Processing methods, Oil seeds processing: Oil extraction methods and refining process; by-products utilization; Effect of processing on nutritive value and physio-chemical properties of vegetable oils.

UNIT-III Vegetables, Fruits and Milk Processing

- 15 Hours

A. Vegetables Processing and Technology: Pigments: Classification, effects on processing of vegetables; Preliminary processing of vegetables; Vegetable products: Fermented and non-fermented and its shelf life; Vegetable waste

utilization; Effect of processing on nutritive value and physio chemical properties of vegetable

B. Fruits Processing and Technology: Concept of maturity, ripening and senescence; Methods of fruit processing technologies: traditional and new methods. Fruit products: fermented and non-fermented; Effect of processing on nutritive value and physio-chemical properties of fruits; Browning reactions: types and mechanism; prevention methods; Fruit waste utilization.

C. Milk Processing and Technology: Milk types, composition, physio chemical properties; Milk processing- Separation, centrifugal process, natural creaming, pasteurization, sterilization, homogenization. Milk storage; Effects of processing on nutritive value and photochemical properties of milk

UNIT-IV Egg, Meat, Poultry and Fish Processing

- 15 Hours

A. Egg: Processing and storage; Effect of processing on nutritive value and physio chemical properties of eggs; changes in egg quality during storage and preservation methods.

B. Meat: Processing and storage; Factors influencing meat quality; Ageing and tenderization of meat.

C. Poultry: Processing and storage of poultry meat; Preservation methods for poultry.

D. Fish: Processing and storage; Preservation methods for fish. Effect of processing on nutritive value and physio chemical properties of meat, poultry and fish.

UNIT-V Post Harvest Technology

- 15 Hours

A. Introduction of post-harvest technology

B. Introduction to post-harvest technology of agricultural produce; Status of Production, Losses, Need, Scope and Importance.

C. Post-Harvest Loss- Definition, Factors contributing to Post-harvest Loss; and Technologies and Practices to reduce Post-harvest Losses.

UNIT-VI: Topics for Self-Study

1. Applications of Microbial enzymes in Food Industry
2. Modern rice milling process
3. Types of driers for dehydration of fruits, vegetables and milk
4. Processing of Fish Protein Concentrates (FPC)
5. Value addition of Processed products, fermented products and extruded products

[https://www.webpal.org/SAFE/aaarecovery/2 food storage/Food%20Processing%20Technology.pdf](https://www.webpal.org/SAFE/aaarecovery/2%20food%20storage/Food%20Processing%20Technology.pdf)

Textbooks

1. Shakuntala Manay N Shadak Cheraswamy M, Food Facts and Principles. New age publisher, 2nd edition, 2004
2. Roday S, Food Science, Oxford publication, 1st edition, 2011
3. B Srilakshmi, Food science, New Age Publishers, 6th edition, 2015
4. Fellows P, Food Processing Technology, 2nd Edition, 2000
5. Avantina Sharma, Text book of food science and Technology, CBS Publisher and distributes ltd, 3rd edition, 2017

Reference

1. Raocg, Essentials of food process engineering, PHI learning private ltd., 2006
2. Janet D Ward and Larry Ward, Principles of Food Science, Stem Publishers, 4th edition, 2006
3. Srivastava R P and Kumar S., Fruits and Vegetables Preservation- Principles and Practices, International Book Distributing Co. 3rd edition, 2006
4. Forsythe S J and Hayes P R, Food Hygiene, Microbiology and HACCP, Gaitersburg Maryland Aspen, 1998
5. Eskein, Biochemistry of Food, Elsevier publications, 1st edition, 2012

Course Type : Elective -II Theory	Course Title : Nutrition in Critical Care
Semester: I	Course Code: P223FS1:D
Credit: 3	Hours /Week: 5

S.No	Course Outcomes	K- Level	Units Covered
CO1	Identify the need for preoperative diet Analyze the prescriptions for post operative diet	K3	I
CO2	Evaluate the principles of enteral nutrition and study the need for parenteral nutrition	K5	II
CO3	Compare the types of burns and construct dietary management during burns, trauma, sepsis, and other surgeries	K4	III
CO4	Assess special nutritional requirements during serious illnesses	K5	IV
CO5	Estimate the complication and other issue in critically ill	K6	V
CO6	Compile the Nutritional management of critical illnesses	K6	I – V

Syllabus

Unit I: Pre- and Post-Operative Diet:

-15 Hours

Type of surgery, physiological response to surgery, assessment of nutritional status, nutritional requirements for various surgical conditions.

Nutritional supports: Role of immune enhancers, conditionally essential nutrients, immune suppressants, and special diets in critical care.

Unit II - Enteral Nutrition and Parenteral Nutrition**- 15 Hours**

Enteral Nutrition - Indications, sites, tubes and care, types of feeds, advantages and disadvantages of home based feed, commercial formula feeds, requirements of nutrients according to problems viz renal, respiratory.

Parenteral Nutrition -Indications, importance, long term effects, uses, sites, care, composition.

Unit III - Nutrition in Stress**- 15 Hours**

Burns- classification, complications, dietary management. Trauma- Physiological metabolic and hormone response to injury, dietary management. Sepsis- systemic metabolic response. Multiple organ dysfunction syndrome- Nutritional assessment and dietary management. Gastric and Intestinal surgery: Short bowel syndrome, GER (Gastro-esophageal reflux) and complications, Ileostomy, Colostomy, Rectal surgery.

Unit IV - Nutrition in Serious Illnesses**- 15 Hours**

Patho-physiological, clinical and metabolic aspects, understanding of the special nutritional requirements, nutritional goals, and monitoring the therapy In critical Illnesses like CV complications and surgery, ESRD, dialysis, transplant, Cancer, AIDS, Hepatic failure and transplants, Neurosurgery.

Unit V - Complications and Ethical Issues**- 15 Hours**

Complications of Nutritional Support Systems include Refeeding Syndrome, Rehabilitation diets – stages, Diet related ethical issues in the terminally ill.

Unit VI -Self Study

Hospital Nutrition : Definition, Social and psychological support to terminally ill. Role of palliative care in different conditions- Elderly, cancer patients, paralyzed patients.

Text Books

1. Mahan LK and Escott – Stump S : Krause's Food Nutrition and Diet Therapy, 10th Ed. W.B. Saunders Ltd, 2000.
2. Rajkumar Rajendram, Victor R. Preedy, Vinood B. Patel, "Diet and Nutrition in Critical Care", Springer New York, 2015.
3. Peter Faber, Mario Siervo,, "Nutrition in Critical Care", Cambridge University Press, 2014.
4. Gopalan.C, Rama Sastri, B.V, and Balasubramian, S.C., "Nutritive Value of Indian Foods", NIN, ICMR. 2012.
5. Miranda Kelly, "Nutrition in Critical Illness, An Issue of Critical Nursing Clinics", Elsevier Health Sciences, 2014.
6. Preiser, "Nutrition in Critical Care", Remedica Publishers, 2005.

Reference Book

1. Zaloga GP. Nutrition in Critical Care, Times Mirror/Mosby, 1994
2. Shils ME, Olson JA, Shike M and Ross AC (Ed). Modern Nutrition in Health and Disease. 9th Edition, Williams and Wilkins, 1999
3. Shikora SA and Blackburn GL (Ed). Nutritional Support – Theory and Therapeutics, Chapman and Hall, ITP (International Thomson Publishing), 1999.
4. Phillips GD and Lodgers CL. Parenteral and Enteral Nutrition. A Practical Guide. Churchill Livingstone, 1986.
5. Kinney JM and Borum PR. Perspectives in Clinical Nutrition. Urban and Schwarzenberg, 1989.
6. Torosian, M. H. (editor) Nutrition for the Hospitalised Patient. Basic Science & Principles of Practice, 1995.

Course Type : Core -III Theory	Course Title : Research Methods in Nutrition
Semester: II	Course Code: P223FS203
Credit: 5	Hours /Week: 6

Course Outcome:

On successful completion of the course the student will be able to

	Course outcomes	K - Level	Unit Covered
CO 1	Determine the scientific method, purpose and approaches to research and Become a qualified researcher.	K4	I
CO 2	Identify and selection of the research sampling and scales of measurement	K4	II
CO 3	Recognize the types of tools applicable to research problem and develop skills of preparing out line of research work and construct common data collection tools	K4	III
CO 4	Apply the numerical data for providing statistical evidences to support the research results and interpretation of data with the use of tables and pictorial representations	K3	IV
CO 5	Analyze research data in a scientific manner and the key elements of a research report and various applications of computer in Nutrition research	K4	V
CO6	Discuss on the types of research, organization and representation of data research design and studies	K5	

Syllabus

Unit I: Foundation of Nutrition Research

- 18 Hours

Meaning, Objectives and Classification of Research Designs

–**Exploratory, Descriptive** – Longitudinal and Cross sectional, Observation-Participant and Non-participant, Epidemiological Surveillance, Retrospective, IN VIVO, IN VITRO and **Experimental** – Pr-Experimental, Quasi Experimental, True Experimental and Statistical Experimental designs.

Unit II: Sampling and Sample Design

- 18 Hours

Sampling Process and Characteristics of good Sampling

1. Classification of Sampling Techniques - Probability and Non Probability Sampling
2. Preparation of Laboratory Food Samples
3. Sampling and Non- Sampling Errors

Measurements and Scaling -

1. Fundamental and Comparative Scales – Meaning and types
2. Nominal Scale
3. Ordinal Scale
4. Interval Scale
5. Ratio Scale

Non comparative Scales– Meaning and types

1. Continuous Rating Scale
2. Itemized Rating Scale
3. Likert Scale
4. Semantic Differential Scale
5. Stapel Scale

Unit III : Data Collection and Preparation

- 18 Hours

Data Collection – Tools

Primary Data

1. Interviews -structured and unstructured
2. Case studies
3. Questionnaire
4. Surveys – Pilot & KAP
5. Laboratory Experiments

Secondary Data

1. Published Sources
2. Unpublished Sources
3. Reliability and Validity of Tools– Meaning
4. Data Preparation Process –
 - Editing
 - Coding
 - Classification
 - Tabulation

Unit IV: Statistical Methods

- 18 Hours

- A. Parametric and Non-Parametric tests –Difference and Applications
- B. Data Analysis Process-
- C. Descriptive Analysis-
- D. Graphical and Diagrammatic Presentations
- E. Central Tendency – Mean, Median & Mode
- F. Dispersion -Standard Deviation
- G. Statistical Inference – Tests of Hypothesis
- H. t – test
- I. ANOVA – One Way & Two Way
- J. Chi- square test – Goodness of Fit &Test of Independence

Unit V: Reporting the Findings and Computer Applications -18Hours

- Report Writing –
- Importance
- Types
- Mechanics
- Guidelines and Precautions
- End Notes- Bibliography, Appendices, Footnotes and Glossary of

terms

2. Computer applications in nutrition research -importance and uses

3. Applicable Statistical Analysis Software-

Literature Searching-PubMed

Data Analysis- Micro Soft Excel, SPSS, Minitab

Plagiarism Checker – Turnitin, Scribb

Textbooks

1. Kothari C R, Research Methodology – Methods & Methodology. Delhi, New Age International Pvt Ltd. 2nd Ed.,2004
2. Chawla,Deepak and NeenaSondhi, Research Methodology -Concepts and Cases. Noida, Vikas Publishing House Pvt Ltd. 2nd Ed.
3. Gupta, S P., Statistical Methods. New Delhi. S Chand & Sons. 45th Ed, 2018, 2019
4. Copper, H.M., Intergrating Research : A guide for literature reviews. California: Sage, 2nd Edition,2002.
5. Kerlinger, Foundation of Educational Research Ingle P.O. Scientific Report Writing. Nagpur, Sarla P. Ingle.

References

1. Ranjit Kumar, Research Methodology: a step-by-step guide for beginners, SAGE Publications. 3rd edition, 2011
2. Anderson, David R and et.al., Statistics for Business and Economics. Delhi, Cengage Learning India Pvt Ltd. 11th Ed. 2013
3. Bandarkar, P.L. and Wilkinson T.S. (): Methodology and Techniques of Social Research. Himalaya Publishing House, Mumbai, 2000
4. Bell, Judith, Doing your Research Project – A guide for first time researchers in education, health and social science. England, Open University Press. 4th Ed., 2005
5. Danial, Wayne W and Chad L Cross, Biostatistics – Basic Concepts and Methodology For the Health Sciences – International Student Version. New Delhi, ArEmmInternatonal, 10th Ed., 2017

Course Type: Core -IV Theory	Course Title : Advanced Dietetics
Semester :II	Course Code :P23FS204
Credit : 5	Hours / Week : 6

Course Outcome:

On successful completion of the course the students will be able to

	Course outcomes	K - level	Unit Covered
CO1	Explain the Nutritional screening technique.	K2	I
CO2	Comprehend the current concepts of therapeutic diets and critically ill.	K3	II
CO3	Analyze the dietary principles on various disorders.	K4	III
CO4	Acquire the knowledge of diet counselling skills.	K4	IV
CO5	Apply the dietary principles to manage the lifestyle disorders in the society.	K3	V
CO6	Plan and prepare for a new food product in various conditioned patients.	K5	

Syllabus

Unit I Nutritional Screening and Management

-18 Hours

- A. Nutritional screening, Nutritional care process, Nutritional Assessment, Nutritional diagnosis , Nutritional Intervention , Monitoring and evaluation.
- B. Basic concepts of diet therapy – Therapeutic adaptations of Normal diet, Principles and classification of therapeutic diets. Routine Hospital diets – Regular, soft, fluid diet
- C. Nutritional Management in critical care -Nutritional screening and nutritional Status assessment of critically ill, Nutritional requirement according to the critical condition
- D. Nutritional support systems: Enteral and parenteral nutrition support- Types, composition, and complications.

UNITII

Medical Nutrition therapy for gastrointestinal and liver disorders

-18 Hours

- A. Upper Gastrointestinal tract Diseases – Nutritional care and diet therapy in Diseases of oesophagus - Oesophagitis, Gastro oesophageal reflux disease[GERD] and Hiatus hernia. Disorders of stomach: Indigestion, Gastritis, Gastric and duodenal ulcers, and dumping syndrome
- B. Lower gastrointestinal tract Diseases/Disorders-Common Symptoms of Intestinal dysfunction - Flatulence, constipation, haemorrhoids, diarrhoea, steatorrhea, Diseases of the large intestine-Diverticular disease, Irritable bowel syndrome, inflammatory bowel disease Diseases of Small intestine-Celiac disease, tropical sprue, intestinal brush border enzyme deficiencies.
- C. Diseases of the Liver-hepatitis, hepaticcoma,cirrhosis, cholecystitis, cholelithiasis and pancreatitis, Zollinger Ellison syndrome and Biliary dyskinesia.

Unit III

-18 Hours

Medical Nutrition therapy for Pulmonary disease, Rheumatic disease and physiological stress

- a. Medical Nutrition therapy for Pulmonary disease-Effect of Malnutrition on pulmonary system, effect of pulmonary disease on nutritional status, chronic pulmonary diseases- Asthma, cystic fibrosis, chronic obstructive pulmonary disease and Pneumonia- Pathophysiology and dietary management.
- b. Medical Nutrition therapy for Rheumatic disease- Etiology, Pathophysiology of Inflammation of Rheumatic diseases, Rheumatoid Arthritis, Osteoarthritis and sjogren syndrome.
- c. Nutritional management of physiological stress- Classification, Complications, Metabolic changes in protein and electrolytes and Dietary management of burns, dietary management of trauma and stress.

Unit IV Weight imbalances and Metabolic Disorders - 18 Hours

- A. Nutritional Management on Weight imbalance -Regulation of food intake and pathogenesis of obesity and malnutrition and starvation; Weight Imbalance: prevalence and classification.
- B. Underweight -Etiology and Dietary management; Obesity-Etiology, classification, Energy balance, dietary modifications and Bariatric surgery- types and dietary modifications of pre and post bariatric surgery.
- C. Nutritional Management in metabolic disorders- Prevalence, Etiology, risk factors, complications and dietary modifications of diabetes mellitus.

Unit V -18 Hours

Nutritional management of cardiovascular diseases, Renal Diseases and Cancer

- A. Nutritional management of cardiovascular diseases-etiology, risk factors, clinical features and dietary modifications of Dyslipidemias, Atherosclerosis , Hypertension, Ischemic heart disease, Congestive cardiac failure.
- B. Nutrition Management of Renal Disease -Etiology, Clinical and metabolic manifestations, Diagnostic tests, Types-Glomerulonephritis, Nephrotic syndrome, Renal Failure: Acute and chronic, ESRD, Nephrolithiasis and Dietary modifications.
- C. Nutritional management in cancer- Pathogenesis and progression of cancer, types ., Symptoms and Dietary management.

Unit VI- Self-Study

Nutritional Management of Immune deficiency, Classification, dietary modification
Nutritional Management of HIV, AIDS- dietary modification
Nutritional Management of Willson disease, Parkinson's Disease, Alzheimer's Disease. Diets -Mediterranean diet, Detoxification, Warfarin Diet and Gluten free Diet.

Text Books:

1. Mahan L.K., Sylvia Escott-StumpKrause" s Food Nutrition and Diet Therapy.W.B. Saunders Company London. 10th edition. 2000.
2. Srilakshmi.B .,Dietetics. K.K. Gupta For New age International Pvt. Ltd. New Delhi Publisher, 2007.
3. Antia F.P. And Philip Abraham,Clinical Nutrition and Dietetics.Oxford Publishing Company., .2001.
4. Passmore P. And M.A. East Wood.(Digitised in Human Nutrition And Dietetics.Churchill Living Stone.,2010.
5. Mudambi S R.,. Rajagopal. M.K. Fundamentals, Food Nutrition and Diet therapy.New Age Publishers. 5th edition,2009.
6. Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., CarwickBasic Nutrition and Diet therapy, Macmillan Publishing Company, 1990.

References:

1. Garrow JS, James WPT, Ralph AHuman Nutrition and Dietetics.Churchill Livingstone, NY. 10th edition. 2000.
2. Groff L James, Gropper S Sareen,Advanced Nutrition and Human Metabolism.West / Wadsworth, UK. 3rd edition, 2000.
3. Sue Rodwell Williams. Nutrition, Diet Therapy.W.B. Saunders Company London. 7th edition. 1993.
4. Whitney, E. N. and C. B..CataldoUnderstanding Normal and Clinical Nutrition. West Pub. S1. Paul. .1983.

E-Learning Resources:

www.nutrition.gov - Service of National agricultural library, USDA.

www.nal.usda.gov/fnic -Food and Nutrition information centre.

www.healthyeating.org.

www.eatrightpro.org.

<https://www.globalhealthlearning.org>.

Course Type: Core -II Practical	Course Title: Advanced Dietetics Practical
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Semester : II	Course Code: P23FS2P2
Credits :4	Hours /Week: 6

Course Outcome:

On successful completion of the course the students will be able to:

	Course Outcomes	K-Level	Unit Covered
CO1	Identify the concept, purpose and principles of diet therapy and the effect of the role and types of dietitians. Gain in-depth knowledge in the running of a dietary department in a hospital.	K2	I
CO2	Analyse solve problems by thinking critically and integrating scientific information and research into practice.	K4	II
CO3	Develop and deliver appropriate information, products, and services to individuals, groups, and populations.	K5	III
CO4	Evaluate the role of various feeding techniques and identify the appropriate technique needed for a specific patient.	K5	IV
CO5	Suggest the antilogical factors and complications, assessment parameters and dietary modifications in management of weight.	K5	V
CO6	Provides opportunity for interaction with patients, and thus, students get hands-on training in hospitals, in association with dietitians and clinicians.	K5	

Syllabus

1. Routine hospital diet : Regular diet, Clear liquid, Soft diet, Full liquid diet and Planning and preparing Enteral feed plan.
2. Assessing requirements and planning diet for obese and underweight individual.
3. Planning and preparing diet for Diabetes Mellitus [IDDM and NIDDM].
4. Planning and preparation of diet for Atherosclerosis with

hypertension.

5. Assessing and planning diets for the following conditions.
6. Celiac disease
7. Lactose intolerance.
8. GERD
9. Peptic ulcer
10. Hepatitis
11. Cirrhosis
12. Planning and preparing diet for Pneumonia
13. Planning and preparing diet for Rheumatic arthritis
14. Planning and preparation of diet for Glomerulonephritis
15. Planning and preparation of diet for cancer according to the condition
16. Planning and Preparing diet for pre and post Bariatric surgery patients.
17. Assessment and planning diet for post burn condition

Textbooks:

1. Stump SE. Nutrition and diagnosis related care. Lippincott Williams and Wilkins. Canada.7th edition, 2012.
2. Width. M& Reinhardt.T, The Essential Pocket Guide for Clinical Nutrition.Wolters Kluwer Publishers. 2nd edition,2018.
3. Whitney EN and Rolfes SR Understanding Nutrition, 9th edition, West/Wordsworth.,2002.
4. Guthrie H., Introductory Nutrition. CV Mosby Co.St. Louis.2002.
5. Elia M, Ljungqvist O, Stratton RJ, Lanham SA.,Clinical Nutrition The Nutrition Society Textbook..2013.
6. Wiley Blackwell Publishers.2nd edition. Mitch, W. and Ikizler, AlpHandbook of Nutrition and the Kidney.Lippincott Williams and Wilkins, New Delhi.6th edition..2010.
7. Mahan LK, Stump SE and Raymond JLKrause's Food and

Nutrition Care Process.Elsevier Saunders.Missouri.13th edition.,.2012.

References:

1. Gopalan C., Ram Sastri B.V. And BalSubramaniam S.C. 2. Nutritive Value of Indian Foods. Hyderabad, National Institute of Nutrition. Indian Council of Medical Research.2006
2. Clinical Dietetics Manual,3.Indian Dietetic Association. 2nd edition. Peggy Stanfield.Y.H.Hui.(2010).
3. .Nutrition and Diet therapy. Jones and Bartlett publishers. William's. (2012).
4. Basic Nutrition and Diet therapy.14th Edition.

Course Type : Elective -III Theory	Course Title: Nutritional Biochemistry
Semester : II	Course Code : P23FS2:A
Credits : 3	Hours / Week: 4

1. Course outcomes

On completion of this course the students will be able to:

	Course outcomes	K-Level	Unit Covered
CO1	Obtain in depth understanding of the biochemical reactions, major and metabolic pathway of carbohydrate	K5	I
CO2	Explain about digestion, absorption, disorders on lipid metabolism and their importance to human health	K5	II
CO3	Evaluate the inter-relationship between the amino acid, proteins and their metabolic pathways of detoxification	K4	III
CO4	Interpret the significance role of genetic material, structure, functions, molecular mechanism of nucleic acids and its biosynthesis	K5	IV
CO5	Introduce terminologies used in the study of enzymology and analyze the role of enzyme kinetics and inhibitors.	K5	V
CO6	Interpret the biochemical importance of the nutrient metabolism and their related disease conditions	K5	V

Syllabus

Unit I: Carbohydrates

-12 Hours

- A.** Introduction, Classification. Structure and Properties of monosaccharides (hexoses and pentoses). Reactions of monosaccharides – oxidation, reduction and reaction with hydrogen cyanide, hydroxyl amine and phenyl hydrazine. Oligosaccharides – Sucrose, maltose, lactose, isomaltose, cellobiose.
- B.** Homopolysaccharides - Structures of storage polysaccharides (Starch and glycogen). Heteropolysaccharides – Structures of Hyaluronic acid, Heparin and Chondroitin sulphate. Metabolism – Glycolysis, TCA cycle, HMP Shunt and energy production in the above pathways. Oxidative phosphorylation and Electron Transport Chain, Uronic acid pathway.

Unit II: Lipids

-12 Hours

Classification – Triglycerides (Fats), Phospholipids and other non phosphorylated lipids- cerebrosides, gangliosides, sulfolipids. Characterisation of fats. Rancidity of fats. Chemistry of Essential fatty acids. Metabolism – Oxidation of fatty acids, biosynthesis of fatty acids (palmitic acid).

Unit III: Aminoacids and Proteins

- 12 Hours

Structure and classification of aminoacids. Classification of proteins – denaturation. Metabolism – phenyl alanine, tyrosine, tryptophan; metabolism of methionine, leucine, arginine. Urea cycle, ammonia circulation, ammonia transport to liver deamination, transamination, decarboxylation and urea formation.

Unit IV: Nucleic acids

-12 Hours

Composition and function. Structure and properties of DNA and RNA (t-RNA, m-RNA and r-RNA), minor RNA types. Metabolism – Biosynthesis and breakdown of purine nucleotides. Biosynthesis and breakdown of pyrimidine nucleotides. Defects in nucleic acid metabolism.

Unit V: Enzymes

-12 Hours

Classification of enzymes. IUB classification Enzyme kinetics – Michaelis Menten equation. Factors affecting enzyme activity (pH, temperature,

substrate concentration and enzyme concentration). Enzyme inhibition – Competitive, Non- competitive and Uncompetitive (Kinetics).

Topics for Self study

Treatment of Metabolic syndrome by combination of physical activity and diet, Oxidation and reduction in the metabolism process and significance, Redox reaction and electron carrier in cellular respiration, Nutritional Genomics.

Text Book:

1. Ambika Shanmugam, “Fundamentals of Biochemistry for Medical Students”, Seventh Edition, New age publishing Pvt.Ltd., New Delhi, 1986.
2. Deb.A.C., “Fundamentals of Bio chemistry”, 5th edition, New Central Book Agency (P) Ltd., 1992.
3. Sathyanarayana, U., Chakrapani, U., “Textbook of Biochemistry”. 3rd edition, Books and Allied (P) Ltd, Kolkata, 2010.
4. West, E.S., Todd, W.R., Mason, H.Sand and Van Brugge, T.J. (1966), Biochemistry, 4th edition, The Macmillan Company, London.

References:

1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2003), Harper” s Illustrated Biochemistry, 26th edition, International Edition.
2. Deb, A.C. (2002), Fundamentals of Biochemistry, New Central Book Agency (P) Ltd.
3. Nelson, L. and Michael.M.Cox. (2005), Lehninger Principles of Biochemistry, 4th Edition, W.H. Freeman and Company, NewYork.
4. Palmer, T. (1995), Understanding enzymes, 4th Edition, Prentice Halls, Ellis Horwood, London.
5. Voet, D., Voet, G.J. and Pralt, W.C. (2002), Fundamentals of Biochemistry, Upgrade edition, John Wiley and Sons, Inc.

E. Reference Link

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1123385/>

2. <https://www.siirt.edu.tr/dosya/personel/beslenme-biyokimyasi-ders-kitabi-siirt-2018221143328398.pdf>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4158967/>
4. [file:///C:/Users/suriya/Downloads/2012Dutheil NutrJ Treatment OfMetSbyCombinationOfPhysicalActivityDietNeedsAnOptimalProteinIntake.pdf](file:///C:/Users/suriya/Downloads/2012Dutheil%20NutrJ%20Treatment%20Of%20Met%20Sby%20Combination%20Of%20Physical%20Activity%20Diet%20Needs%20An%20Optimal%20Protein%20Intake.pdf)

Course Type: Elective III Theory	Course Title : Sensory Evaluation
Semester :II	Course Code :P23FS2:B

Credit:3	Hours/ Week :4
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Course Outcomes

	Course Outcomes	K level	Unit Covered
CO1	Identify the sensory evaluation and its advantages and disadvantages	K2	I
CO2	Apply the different kinds of test and panel members used for food groups	K3	II
CO3	Analyze various types of Aroma, flavor and oral texture in food products.	K4	III
CO4	Design the various levels of questionnaire and evaluation scorecard.	K5	IV
CO5	Create a sample score card and it's used for Consumer acceptability in sensory evaluation	K5	V
CO6	Design the product development, quality control and marketing within the food industry	K5	

Syllabus 2

Unit I- Introduction to sensory analysis and uses of sensory tests

-12 Hours

Definition, objectives, Importance, applications of sensory evaluation. Advantages and disadvantages of sensory evaluation. Intrinsic and extrinsic sensory attributes of food products, Neural networks in sensory perception. General testing conditions.

Unit II -

-12 Hours

Selection of test subjects and training of panel - Types of tests: Discrimination/difference test. Paired test, triangle test and duo-trio test; tests for multiple samples, difference from control/reference. Quantitative Difference Tests: Ranking, Numerical scoring test, magnitude estimation. Descriptive

Tests: Rating for sensory profile, consensus profiling, conventional profiling, free choice profiling. Threshold tests Acceptance test. Monadic, paired, and sequential monadic.

Unit III - - 12 Hours

Descriptive analysis - Definition, Importance, Function of appearance, Aroma, flavour and oral texture. stage of the production process including - Research and development, Quality control, Define product attributes, Product comparison, Shelf-life studies. Methods of sensory evaluation - Flavour Profile Method, Texture Profile Method, Spectrum Descriptive Analysis and Quantitative Descriptive Analysis. concept alignment and selection of terms.

Unit IV – - 12 Hours

Designing of questionnaire and/or evaluation scorecard.

Questionnaire – Introduction, Definition, Importance of designing questionnaire, Questionnaire methods, question wording, Question order, Steps of question. Evaluation Scorecard – introduction, Importance, Contents of scorecard, Methods used for score card. Merits and Demerits of scored card.

UNIT – V - 12 Hours

Consumer acceptability using sensory evaluation- Introduction, Methods, Sensory Science and Decision Making in Food Industry, Sensory Evaluation and Quality of Food, Sample Preparation and Delivery, Selection of Panel Members. Factors Affecting Sensory Measurements- . Psychological Factors, Physiological Factors. Principles of Good Sensory Testing, Selecting Consumers

VI Topic of Self Study - scientific method used to evoke, measure, analyse, and interpret those responses to products as perceived through the senses of sight, smell, touch, taste, and hearing.

Text Book

1. Lyon, D.H.; Francombe, M.A.; Hasdell, T.A.; Lawson, K. (eds) Guidelines for Sensory Analysis in Food Product Development and Quality

- Control. Chapman and Hall, London.1992
2. Amerine, M.A.; Pangborn, R.M.; Roessler, E.B Principles of Sensory Evaluation. Academic Press, New York. 1965
 3. Kapsalis, J.G. Objective Methods in Food Quality Assessment. CRC Press, Florida. 1987
 4. Martens, M.; Dalen, G.A.; Russwurm, H. (eds) Flavour Science and Technology. John Wiley and Sons, Chichester. 1987
 5. Moskowitz, H.R. (eds) Food Texture: Instrumental and Sensory Measurement. Marcel Dekker Inc. New York. 1987
 6. Lawless, H.T. and Klein, B.P. Sensory Science Theory and Applications in Foods. Marcel Dekker Inc. 1991
 7. Jellinek, G. Sensory Evaluation of Food Theory and Practice. Ellis Horwood, Chichester. 1985

Reference

1. Meilgaard, M.; Civille, G.V.; Carr, B.T. Sensory Evaluation Techniques, Vols. I and II, CRC Press, Florida. 1987
2. Moskowitz, H.R. Product Testing and Sensory Evaluation of Foods: Marketing and R & D approaches. Food and Nutrition Press, Connecticut 1983
3. Moskowitz, H.R New Directions for Product Testing and Sensory Analysis of Foods. Food and Nutrition Press, Connecticut.1985
4. O'Mahony, M. Sensory Evaluation Practices. Academic Press, London. 1986
5. Watts, B.M., Ylimaki, G.L., Jeffery, L.E. and Elias, L.G. Basic Sensory Methods for Food Evaluation. The International Development Research Centre, Ottawa, Canada.1989
6. Askar, A. and Treptow Quality Assurance in Tropical Fruit Processing. Springer-Verlag, New York. 1993

Course Type :Elective - IV - Theory	Course Title: Perspective of Home Science
Semester: II	Code:P23FS2:C

Credits: 3**Hours/ Week: 4**

	Course Outcomes	K-Level	Unit Covered
CO1	Outline the concept of Extension Education and its importance	K2	I
CO2	Comprehend the key aspects of human growth and development and realize the importance of mastering developmental tasks of each life span stage	K3	II
CO3	Apply the knowledge of the basic concepts of textile and Clothing	K2	III
CO4	Compare the personal goals and values, set living standards	K1	IV
CO5	Apply the meaning of Guidance and Counselling and Career perspectives in Home Science	K3	V
CO6	Discuss on various branches of Home Science for strengthening the extension and research base	K5	I-V

Syllabus

UNIT I – Extension Education

-12 Hours

Meaning, Definition, Objectives, characteristics, principles, Extension teaching methods- types and methods. Qualities of a good extension worker. Communication, innovation and social change.

UNIT II – Human Development

-12 Hours

Growth, Development, maturation and learning. Principle and developmental stages and task. Parental Disciplinary Techniques- merits and demerits. Early

childhood Education – objectives, types of Nursery Schools. Exceptional children- Deaf, Blindness, Physical Impairment, Mental Retarded and Giftedness, Rehabilitation.

UNIT III – Textiles and Clothing

- 12 Hours

Classification and General properties textile fibres. Processing and manufacturing of cotton, silk, wool and rayon fibres. Yam – Classification. Fabric construction – woven, non-woven and knitted fabric. Clothing – selection for the family.

UNIT IV – Family Resource Management

- 12 Hours

Home Management – Meaning, objectives and process. Resources – classification and characteristics. Time, money and Energy management. Decision making – steps and methods of resolving conflicts. Work Simplification – importance of work simplification. Mundell's classes of change. Principles and elements of Interior Design, Various colours and colour schemes.

UNIT V – Guidance and Counselling

Meaning, nature, types and scope of guidance and counselling. Various steps and techniques of guidance and counselling. Need and importance of educational guidance.

UNIT VI -Self Study Topics

Apparel Manufacturing, Fabric and Apparel Sciences- Money Management and Human Resource Management- Family studies.

Textbooks:

1. Jha, J.K. (2002). Encyclopaedia of Teaching of Home Science, Vol.I,II and III . New Delhi: Anmol Publications

2. Suraikanthi.A., (2002). Child Development – An Introduction Gandhigram.: Kavitha Publications.
3. Srilakshmi.B. (2015). Food Science. New Delhi. New Age International Pvt.Ltd.
4. PremlataMullick (2016), 4TH edition, Kalyani Publishers.

References:

1. Serene and Ahlawat Santos Shekhar (2013), Textbook of Home Science Extension Education.
2. Tami James Moore and Sylvia M Asay (2008), Family Resource Management, Sage Publications.
3. Diane E. Papalia (2004), 9th Edition, Human Development, Mc Graw Hill India.
4. Rani K. Sudha and Srivastava Sushila, Textbook of Human Development A lifespan development approach, S. Chand & Co Ltd.

E- Learning:

<https://www.globalhealthlearning.org>.

<https://www.researchgate.net>

[https://www. Icar.org.in](https://www.Icar.org.in)

[E-Learning Programs \(nestlenutrition-institute.org\)](https://www.nestlenutrition-institute.org)

<https://www.udemy.com/share/1027yA/>

Course Type : Elective - IV Theory	Course Title :Nutraceuticals and Functional Foods
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Semester : II	Course Code : P23FS2:D
Credits : 3	Hours / Week : 4

Course outcomes

On completion of this course the students will be able to:

	Course outcomes	Level	Unit Covered
CO1	Describe the components of nutraceuticals and functional food	K4	I
CO2	Assess the role of antioxidants and phytochemicals in health and prevention of diseases	K5	II
CO3	Apply the effects of prebiotics and probiotics and formulate some innovative foods	K5	III
CO4	Evaluate the role of commercial nutraceuticals and functional foods in the community	K5	IV
CO5	Interpret the related recent trends in the market and to know implications of functional foods with respect to ethical and social issues	K5	V
CO6	Interpret the potential role of nutraceuticals, functional foods and dietary supplements for their health promotion.	K5	

Syllabus

Unit I: Nutraceuticals and functional Foods

-12 Hours

Definition, concept. Classification of nutraceuticals and functional foods, The importance of nutraceuticals is expanding globally in terms of scientific services, legal aspects, and marketing strategies for health promotion, reduction of disease geographical position and cultural heritage, sources of nutraceuticals, Regulations regarding the quality and safety of nutraceuticals.

Unit II: Nutraceuticals & Phytochemicals

-12 Hours

Natural occurrence of certain phytochemicals- Antioxidants and flavonoids: omega – 3 fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds. Standards for health claims, Process of developing -preclinical & clinical studies. Health benefits to reduce the risk of chronic diseases, dietary supplements, fortified dairy products, and citrus fruits, and vitamins, minerals, herbals, milk, and cereals.

Unit III: Innovative and fortified Food

-12 Hours

Probiotics, prebiotics- definition, Characteristics, type's role of human body, importance of human nutrition, Health benefits, GMO-definition, types, benefits GM food, list GM foods- Soybeans, corn, rice, tomato, and cotton, Importance of GM food, regulations related GM foods.

Unit IV: Nutraceutical Formulations and Challenges

-12 Hours

Important role in future therapeutic developments- (phytomedicines/nutraceuticals/food supplements/conventional drugs) bioavailability. Nutraceutical formulation's and challenges, stability and safety evaluation, bio accessibility and factors affecting bio accessibility, Bio active of functional foods and Nutraceutical.

Unit V: Nutraceuticals in disease

-12 Hours

- A.** Nutraceuticals in disease prevention-and risk factors for coronary heart diseases, Diet and coronary heart diseases relationship, probiotics, prebiotics and omega 3 fatty acids for prevention of coronary heart diseases; Prevalence and causes of obesity,
- B.** Foods and cancers: anti-tumour action of phytochemicals, antioxidants and dietary fibres role of nutraceuticals in health and disease management – diabetes mellitus, cancer; non-essential nutrients as dietary supplements, FOSHU foods.

Topics for Self-study

Current trends and future perspectives on functional foods and nutraceuticals; Microencapsulation of Probiotic Bacteria; Scope and approach of phytonutrients; Bioaccessibility of Phytonutrients

Text Book:

1. Min-Tze Liong , “Beneficial Microorganisms in Food and nutraceuticals, Microbiology Monographs, ISSN 978-3-319-23177-8 (eBook)
2. Cupp J & Tracy TS. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press. 2003.
3. Galanakis C, Nutraceutical and Functional Food Components: Effects of Innovative Processing Techniques. Academic Press (2017).
4. Robert EC, Handbook of Nutraceuticals and Functional Foods. CRC Press (2006).

Text Book:

1. Wildman, Robert. Nutraceuticals and Functional Foods, second edition. Taylor and Francis Group. 2007.
2. Gibson GR & William CM. Functional Foods - Concept to Product. 2000.
3. Goldberg I. Functional Foods: Designer Foods, Pharma Foods. 1994.
4. Brigelius-Flohé, J & Joost HG. Nutritional Genomics: Impact on Health and Disease. Wiley VCH. 2006.

Reference Links:

<https://pubmed.ncbi.nlm.nih.gov/12400637/>

<https://www.sciencedirect.com/science/article/abs/pii/S0924224419307186>

Course Outcomes

Course Type : NMEC -I Theory	Course Title : Detection of Food Adulterants
Semester: II	Course Code: P23FS2E1
Credit: 2	Hours /Week: 4

On completion of this course the students will be able to:

	Course Outcomes	K- Level	Units Covered
CO1	Identify the adulteration of common foods and their adverse impact on health	K3	I
CO2	Compose certain skills for detecting adulteration of common foods.	K6	II
CO3	Assess the adulteration of some other kinds of foods, detection and remedies.	K5	III
CO4	Examine basic laws and procedures regarding food adulteration and consumer protection	K4	IV
CO5	Assess the Laboratories in quality control	K5	V
CO6	Explain the common adulterant in Food	K5	I - V

UNIT-I – Common Foods and Adulteration:

-12 Hours

Common Foods subjected to Adulteration - Adulteration – Definition – Types; , Foreign matter, Cheap substitutes, Spoiled parts. Adulteration through Food Additives – Intentional and incidental. General Impact on Human Health.

UNIT-II –: Methods of Detecting Adulterants - I:

-12 Hours

Means of Adulteration Methods of Detection Adulterants in the following Foods; Milk and Milk Products, Oils and fats, Sugars and Confectionery, Food grains and its products.

UNIT-III –: Methods of Detecting Adulterants - II:

-12 Hours

Means of Adulteration Methods of Detection Adulterants in the following Foods : Salts, Spices and condiments, Processed food, Fruits and vegetables, Beverages. Analysis of preservative and coloring materials, test enhancing, sweetening flavoring materials (msg).

UNIT-IV –:Present Laws and Procedures on Adulteration: -12 Hours

Basic Highlights of Food Safety and Standards Act 2006 (FSSA) –Food Safety and Standards Authority of India–Rules and Procedures of Local Authorities.

Role of voluntary agencies such as, Agmark, I.S.I.

UNIT – V -12 Hours

Quality control laboratories of companies, Private testing laboratories, Quality control laboratories of consumer cooperatives. Consumer education, Consumer’s problems rights and responsibilities, COPRA 2019 - Offenses and Penalties – Procedures to Complain – Compensation to Victims.

UNIT – VI – Self Study

Adverse effects of excessive food colourants. Case studies from food industry regarding mishandling of food additives, Safety standards to be followed in food processing units.

Text Books

1. A first course in Food Analysis–A.Y. Sathe, New Age Publications, New Delhi .,1999
2. Food Safety, case studies–Ramesh.V.Bhat, NIN, 1995.
3. Battershall, J. P. *Food adulteration and its detection*. E. & F.N. Spon. 1887
4. Srilakshmi, B., “Food science” ,7th edition, New Age Publications., New Delhi., 2018.
5. Potter, N.N. and Hotchkiss, H.J., “Food Science”, 5th edition, CBS Publishers and Distributors, New Delhi, 2007.
6. FAO Manuals of Food Quality Control. 2-Additives Contaminants Techniques, Rome, 1980.

Reference Book

1. DART book by FSSAI, India.
2. Edward G. Schilling., "Acceptance Sampling in Quality control", 2nd Edition, CRC Press, Mallbook., 1996
3. Swaminathan.M., "Essential of Food and Nutrition", New Age Publication, New Delhi.2011
4. Eillian H. Meyer, "Food Chemistry", Affiliated West Press, New Delhi,1973.
5. Early, R. Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London, 1995.
6. Pomeraz, Y. and MeLoari, C.E.: Food Analysis: Theory and Practice, CBS publishers and Distributor, New Delhi, 1996

Course Type: Core -V Theory	Course Title : Micronutrients
Semester :III	Course Code: P23FS305
Credits : 5	Hours / Week :6

Course Outcomes:

On completion of the course the students will be able to...

	Course Outcomes	K Level	Unit Covered
CO1	Evaluate the specific role of functional foods and nutraceuticals in prevention of degenerative disease.	K2	I
CO2	Recognize the importance of micronutrients in growth and development of humans.	K3	II
CO3	Analyse the importance of diet in maintaining human health to combat nutrient deficiency in the community	K4	III
CO4	Apply knowledge of the physiological and metabolic functions of vitamins and minerals and their implications	K5	IV
CO5	Analyse the recent advances in the field of micronutrient and research for the welfare of the community	K5	V
CO6	Estimate insight about recent concept and findings in field of nutrition and application of the same to prevent disease	K6	I-V

UNIT I Macro minerals**- 18 Hours**

Distribution in the body; functions, effects of deficiency, food sources, requirement and recent research of macro minerals - Calcium, Phosphorus, Magnesium, Potassium, Sodium and Chloride.

UNIT – II Micro Mineral**-18 Hours**

Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of micro minerals and trace minerals. Micro minerals - iron, zinc, fluoride, copper, iodine and manganese. Trace Minerals - Selenium, cobalt, chromium, silicon, boron and nickel

Selenium and Vitamin E relationship, Chromium and glucose tolerance factor.

UNIT III: Fat Soluble Vitamin**-18 hours**

Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of Fat Soluble Vitamins A,D,E and K

UNIT IV:Water Soluble Vitamin**-18 Hours**

Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of Water soluble vitamins – Water soluble vitamins: vitamin C, thiamine, riboflavin, niacin, pantothenic acid, biotin, folic acid, vitamin B12, vitamin B6, choline and inositol.

UNIT V: Recent Concepts In Nutrition:**- 18 Hours**

Immuno-nutrients and Antioxidants, Definition, classification and function of functional food and nutraceuticals. Antinutrients present in various food groups – Cereals, legumes and nuts and oil seeds Food and drug interaction.

Unit VI: Topic For Self-Study

Dietary supplements and fortification, multivitamin supplementation benefits and regulations.

Text Books

1. Guthrie, H.A., "Introductory Nutrition", Tenth edition, C.V. Mosby Company, St. Louis, 2001.
2. Bogert, J.G.V., Briggs, D.H., Calloway, "Nutrition and physical fitness",

- 11th edition W.B. Saunders Co., Philadelphia, London, Toronto, 2000
3. Wardlaw, G.M and Kessel, M., “ Pererspective in Nutrition”, 5thedition, Mc Graw Hill, New York, New Delhi, 2002
 4. Willium, S. R., “ Nutrition and Diet Therapy”, Mosby Co., St. Louis, 2000
 5. Sizer, F.S and Whitney E. R., “ Nutrition , Concepts and Controversies” 9th edition, Thomas Wadsworth, Australia, 2003

Reference Book

1. Brown, J.E., “Nutrition Now”, 3rd edition, Wadsworth Thomson Learning, New York, 2002
2. Maurice, E. Shils, James A. Olson, Moshe shike., “ Modern Nutrition in Health and Disease”, 8th Edition, Vol I and II, Lea & Febiger Philadelphia, A Waverly Company, 2000.
3. Mahan L.K. and Stamp, S.E., “Krause’s Food Nutrition and Diet Therapy”, 11th edition, W.B. saunder’s Company, Philadelphia, 2000.
4. Toteja, G.S and Singh P., “ Micronutrient Profile of Indian Population”, ICMR Publication, New Delhi, 2004
5. D. M. Swaminathan, “Principles of Nutrition and Dietetics”, BAPPCO, 88, Mysore Road,Bangalore,2002

E-Learningresources:

<https://www.udemy.com/share/1027yA/>

[WHO | The e-learning platform Nutrition Knowledge Hub launch WFP Nutrition's Learning Platform - UN World Food Programme Nutrition Online Courses | Coursera](#)

[E-Learning Programs \(nestlenutrition-institute.org\)](#)

[WFP Nutrition's Learning Platform | Humanitarian Library](#)

Course Type: Core -VI Theory	Course Title : Techniques in Food Analysis
Semester :III	Course Code: P23FS306
Credits : 5	Hours / Week :6

Course outcomes

On completion of this course the students will be able to:

	Course outcomes	K-Level	Unit
CO1	Apply the knowledge obtained to choose the appropriate instrument and technique for food analysis	K5	I
CO2	Assess the role of chromatography and spectrometry in food analysis	K5	II
CO3	Study the importance of advanced chromatography and electrophoresis techniques	K4	III
CO4	Elaborate the principle behind the functioning of fluorimetry and flame photometry	K5	IV
CO5	Analyze the methods and types of radioactive isotopes and their functions.	K5	V
CO6	Assess the usage of various analytical techniques for quality of food analysis.	K5	V

2. Syllabus

Unit I: Analytical Instrumentation and Spectroscopic Techniques

-18 Hours

Need for analysis and instrumentation, Selecting an appropriate instrumental technique, criteria for selecting a technique, Limit of Detection (LOD) and Limit of Quantification (LOQ) Colorimetry, Spectrophotometry-definition and derivation of Lambert-Beer" s Law, Atomic-Absorption Spectroscopy (AAS),Inductively Coupled Plasma – Optical Emission Spectrophotometry (ICP- OES/MS), **Nuclear Magnetic**

Resonance Spectroscopy (NM)(SS), Fourier Transform Infrared Spectroscopy (FT-IR) - Principle, Instrumentation and Applications

Unit II: Chromatographic Techniques -18 Hours

Basics and Classification of Chromatography- Adsorption, partition, size exclusion, ion-exchange, affinity Gas Chromatography, Liquid Chromatography - Instrumentation, Sampling Techniques and Applications, Applications of HPLC, Comparison of HPLC and GC

Unit III: Advanced Chromatographic Techniques and Electrophoresis -18 Hours

Thin Layer Chromatography, High Performance Thin Layer Chromatography (HPTLC), Hyphenated Techniques - Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS), Principles and procedure of electrophoresis – **Paper and Agar Electrophoresis(SS)** Moving boundary electrophoresis, PAGE

Unit IV: Fluorimetry and Flame Photometry -18 Hours

Theory of fluorescence (SS) and instrumentation, Instrumentation in Flame Photometry- oxidant, fuel, filter, detector, amplifier, applications

Unit V: Measurement of Radioactivity - 18 Hours

Radio active isotopes (SS) Methods and Types Radioactive Counters- gas and liquid Scintillation- uses, applications and safety

Topics for Self-studies

Diverse food based applications of NMR, UV spectroscopy –Principle, Instrumentation, Applications, Ultra-sonication, Application and Processes of ultra-sonication.

Text Books

1. 1.S. Suzanne Nielsen Food Analysis Laboratory Manual. Springer International Publishing. Third Edition. 2017
2. S. Suzanne Nielsen Food Analysis. Springer International Publishing. Fifth Edition. 2017

3. Otlés, S. "Methods of Analysis of Food Components and Additives" CRC Press, USA. 2005
4. Ranganna, S. "Handbook of Analysis and Quality Control for Fruit and Vegetable Products". Tata-McGraw- Hill, India. 2nd edition. 2001
5. Sadasivam, S and Manickam, A "Biochemical Methods". New Age International Publishers, New Delhi. 2nd Edition. 1997

Reference :

1. Jayaram, I, "Laboratory Manual in Biochemistry", New Age International Publishers, New Delhi. Fifth ed. 1996
2. Raghuramulu, N, Nair K.M & Kalayanasundaram, S.A, "Manual of Laboratory Techniques", National Institute of Nutrition, ICMR., 1983
3. Frank, Settle, Editor, "Handbook of Instrumental Techniques for Analytical chemistry", ISBN 0-13-177338-0.
4. S.M Knopkar, Basic concepts of Analytical Chemistry," Basic concepts of Analytical Chemistry. New Age International (P) Ltd., Publishers
5. R S Khandpur, Handbook of Analytical Instruments, 3rd editions.
6. Skoog, Holler, Crouch. "Principles of Instrumental Analysis ", Seventh Editions.

Reference Links

1. <https://www.foodandnutritionjournal.org/vol04nospl-issue-conf-october-2016/nuclear-magnetic-resonance-spectroscopy-applications-in-foods/>
2. <https://microbenotes.com/uv-spectroscopy-principle-instrumentation-applications/>
3. <https://www.hielscher.com/technolo.htm>

Course Type: Core -VII Theory	Course Title :Performance Nutrition
Semester: III	Code: P23FS307
Credits: 5	Hours/Week: 6

1. Course Outcomes

On completion of this course the students will be able to:

S.No	Course Outcome	Level	Unit Covered
CO1	Apply the suitable technique to assess body composition of athletes	K3	I
CO2	Distinguish the role of Macro and micronutrients towards athletic performance	K4	II
CO3	Analyse the role of nutrition in competitive performance and for special needs	K4	III
CO4	Explain various sports supplements and Ergogenic aids for the athletes	K5	IV
CO5	Assess personalized nutrition guidance in the area of sports nutrition	K5	V
CO6	Explain the importance of nutrition in sports and athletic performance	K5	I-V

2. Syllabus

UNIT-I Nutritional Assessment

-18 Hours

A. Nutritional assessment for athletes-assessment of body composition, techniques of measuring body composition, surface anthropometry, Biochemical, clinical and dietary assessment, Body composition and sports performance.

B. Energy requirements for optimal athletic performance- Energy production, Energy metabolism in Athletes, Fatigue and exercise, energy requirements of athletes, factors affecting energy requirements of athletes.

UNIT-II Nutritional Requirement in sports performance -18 Hours

A. Carbohydrates in sports performance- Carbohydrate types, Glycaemic index and Glycaemic load, carbohydrate utilization during exercise, carbohydrate loading, fuelling before during and after exercise, carbohydrate requirements for athletes.

B. Protein and fat requirement for sports performance -protein and exercise, requirements of protein and fat for athletes, factors affecting protein requirements, protein needs and vegetarian athletes.

UNIT-III Micronutrients for sports -18 Hours

A. Micronutrients in sports- vitamins and mineral requirements in athletes, sports anaemia, antioxidants and exercise induced free radicals.

B. Hydration for athletes- Fluid balance and thermoregulation, fluid and electrolyte requirements for athletes, Effects of dehydration, factors affecting fluid intake, gastric emptying and fluid delivery to working muscles, Fluid intake before, during and after exercise.

UNIT-IV Nutrition for competition performance -18 Hours

A. Nutrient timing, pre-competition nutritional guidelines, nutrition during exercise and nutrition after exercise, nutrition plan for specific sports events.

B. Ergogenic aids- Categories of Ergogenic aids and Ergolytics.

C. Sports foods-sports drinks, sports gels, Sports energy bars and sports gels.

UNIT-V Athletes with Special Dietary needs

-18 Hours

A. Nutrition for athletes with special dietary needs- Nutrition for special population like children, young and older athlete, Female athlete triad, weight loss and weight gain in athletes, vegetarian athlete, diabetic athlete, athletes with disabilities, factors affecting nutritional needs for travel athlete, GI stress and athletes.

UNIT-VI Topics for Self-Study

1. Effect of refuelling in muscle damage
2. The pros and cons of sports foods
3. Low-GI carbohydrates and sugar : pre-event friends and enemies
4. Factors possibly associated with runner's diarrhoea
5. Basal metabolic rate for athletes in different sports events

https://stillmed.olympics.com/media/Document%20Library/OlympicOrg/IOC/Who-We-Are/Commissions/Medical-and-Scientific-Commission/Encyclopaedia/2014_Maughan_002.pdf

Text Books

1. Deakin, Burke, Clinical Sports Nutrition, McGraw-Hill Australia, 3rd edition, 2006
2. Bean, Anit, The complete guide to Sports Nutrition, A&C, Black. London, 6th edition, 2010
3. Bourns, Fred, Essentials of Sports Nutrition, John and Wiley, 2nd edition, 2002
4. Srilakshmi, B. Suganthi.v, C.Kalaivani Ashok, Exercise physiology fitness and sports Nutrition, New age publishers, 1st edition, 2017
5. Benardot, Dan, Advanced Sports Nutrition, Human Kinetics, 2002

Reference

1. Burke, Louise, Practical Sports Nutrition, Human Kinetics, 2007
2. Gleeson, Jeukendrup, Sports Nutrition: An Introduction to Energy Production and
3. Suzanne Girard Eberle, Endurance Sports Nutrition, Human Kinetics, 2000
4. Natalie Digate Muth, Sports Nutrition for health professionals, Quincy Mcdonald, 2015
5. D. Enette Larson-Meyer, Vegetarian sports nutrition, Human kinetics, 1963

Course Type : Core Practical -III	Course Title : Food Microbiology Practical
Semester III	Code:P23FS3P3
Credit :4	Hours / Week: 6

Course Outcomes

At the end of the course, the students will be able to:

	Course Outcomes	K-Level	Unit Covered
CO1	Interpret various staining methods to identify the microbes in foods.	K2	I
CO2	Assess the role of microorganisms in fermentation.	K3	II
CO3	Evaluate the role of microorganisms in food spoilage and their effects.	K3	II, III
CO4	Illustrate the preparation of plating techniques	K4	IV
CO5	Compare various physical and chemical methods used in the control of microorganisms	K5	V
CO6	Cultivate and enumerate microorganisms from various food samples	K6	V

Syllabus

1. Sterilization of glassware and Equipments

- 1.1 Sterilization by dry heat
- 1.2 Sterilization by moist heat
- 1.3 Sterilization by filtration

2. Staining methods

- 2.1 Preparation of smear
- 2.2 Simple staining
- 2.3 Gram's staining method

3. Cultivation of micro-organism

- 3.1 Types of culture

- 3.2 Incubation of culture
- 3.3 Method of inoculation

4. Plate culture

- 4.1 Preparation of plate for streaking
- 4.2 Streak plates: Separation of mixed culture

5. Determination of Number of viable organisms in a sample

- 5.1 Colony Count method
- 5.2 Dilution Tube count method
- 5.3 Dye reduction method

6. Microbial examination of food

- 6.1 Sampling procedure
- 6.2 Detection of *clostridium welchii* in water
- 6.3 Microscopic examination of milk
- 6.4 Microscopic examination of canned foods
- 6.5 Microscopic examination of fruit juices and squash
- 6.6 Microscopic examination of bread

References:

1. Microbial Biotechnology by Glazer AN & Nikaido H., 2nd Ed., Cambridge University Press, 2007
2. Biotechnology: A text Book of Industrial Microbiology by Crueger W, Crueger A, 2nd Ed., Sinauer associates, Inc.1990
3. Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology. Volume 2 by Joshi.
4. Essentials of Food Microbiology. Edited by John Garbult. Arnold International Students Edition.
5. Adams MR and Moss MO. Food microbiology, New Age international (P) Ltd., New Delhi.2006.

6. Chris Bell, Paul Neaves, Anthony P. Williams. Food Microbiology and Laboratory Practicals 2nd edition, Blackwell Scientific Publishers, UK. 2006.
7. Choudhary NL. Food Processing and Biotechnology Applications, Oxford Press, New Delhi.26012.
8. Frazier WC and Westhoff DC. Food Microbiology, Sixth edition, Tata McGraw-Hill Publishing Ltd., New Delhi. 2005.
9. Sinha and Sharma. Food Microbiology, Oxford Book Company, New Delhi. 2012.
10. Varun Mehta. Food Biotechnology, Campus Books International, New Delhi. 2006.
11. Vijaya Ramesh K. Food Microbiology, MJP Publishers. 2007.
12. Lund BM, Baird Parker AC and Gould GW. The Microbiological Safety and Quality of foods. Vol. 1-2, ASPEN Publication, Gaithersberg, MD. 2000.

Course Type: Elective V Theory	Course Title : Food Microbiology
Credit :3	Code:P23FS3:A
Semester III	Hours / Week: 3

1. COURSE OUTCOMES

At the end of the course, the students will be able to:

	Course Outcomes	K-Level	Unit Covered
CO1	Obtain a depth understanding on the scope of microbiology and the different culture techniques.	K2	I
CO2	Comprehend insight on various techniques of staining and hanging drop method to understand the morphology of microorganism.	K3	II
CO3	Apply and Evaluate of the isolate microorganism form different sources like air, water and food.	K3	III
CO4	determine the viable count of microorganism from food samples.	K4	IV
CO5	Acquire knowledge on the industrial microbial products and diagnostic tools of medical microbiology	K5	V
CO6	Gain intense knowledge on the microbial culture and foods, detection methods and techniques involved.	K6	

Unit – I General microbiology**- 9 Hours**

1. Cleaning and sterilization of glass wares.
2. Handling of hot air oven and autoclave.
3. Uses and study of microscopes.

Unit II Preparation of culture media and their sterilization. - 9 Hours

Cultivation of bacteria

- i) Pour plate method.
- ii) Spread plate method.
- iii) Streak plate method

Unit III Study of Morphology of microorganism**- 9 Hours**

- I. Staining of bacteria
- II. Simple staining.
- III. Gram staining.
- IV. Microscopic test for bacterial motility by hanging drop method.

Unit - IV Isolation of micro organisms from different sources - 9 Hours

- I. Air (Petri plate exposure method)
- II. Microbial testing of water
- III. Determination of microbiological quality of milk

Unit V Determination of viable count of microorganisms

1. Introduction to colony counter
2. Total plate count
3. Yeast and mold count

Unit VI Topics for self study:

1. Establishing the Endopeptidase e-MS Method as a Screening Method for Botulinum Neurotoxins in Media and Foods
2. Beneficial Bacteria

Text Books

1. Frazier W.C and Westhoff D.C Food Microbiology, Tata McGraw Hill Publishing Co., Ltd. New Delhi ,2013
2. Annak.Joshua, Microbiology, Popular Book Depot.Chennai-15. 2001
3. Ray, B. Fundamental Food Microbiology, 2nd Ed, CRC press, Boca raton F. 2001)
4. Joshi VK & Pandey Biotechnology: food, fermentation, microbiology, biochemistry and technology, vol I & II, Educational publishers and distributors, New Delhi. 2004
5. Crueger W and Crueger A Biotechnology: A textbook of Industrial Microbiology 2nd Edition, Panima Publishing Corporation, New Delhi. 2003

Reference Book

1. Gutierrez-Lopez GF and Barbosa-Canovas GV (Eds) Food Science and Food Biotechnology CRC press, USA. 2003
2. Halford NG 'Genetically Modified Crops' Imperial College Press, UK
Modern Food Micro-Biology by James M. Jay, (2000), 6th edition, An Aspen Publication, Maryland, USA. 2003
3. Food Microbiology: Fundamentals and frontiers by M.P. Doyle, L.R. Beuchat and Thoma J. Montville, 2nd edition, ASM press, USA.
4. Micheal Pelczar MJ, Chan ECS, Krieg N. Microbiology. 5th ed. Tata McGraw-Hill Publishing Co. Ltd. 2001
5. Prescott LM, Harley JP, Klein DA. Microbiology. 6th ed. WMC Brown Reference Link, 2008

- <https://www.ifsh.iit.edu/projects/food-microbiology-current-topics-investigation>

<https://pubmed.ncbi.nlm.nih.gov/26642690/>

- <https://askabiologist.asu.edu/beneficial-bacteria>

Essential for life -

<https://www.reactgroup.org/toolbox/understand/bacteria/bacteria-are-essential-for-human-life/>

Course Type: Elective V Theory	Course Title: Food Packaging
Semester : III	Course Code : P23FS3:B
Credits : 3	Hours /Week : 3

1. Course Outcomes

On completion of this course the students will be able to:

	Course Outcomes	Level	Unit
CO1	Explain the role of packaging in the food industry	K2	I
CO2	Compare the advantages and disadvantages of various packaging material	K2	II
CO3	Identify the types of packaging and their usage in packing various foods	K3	III
CO4	Analyse the differences in packing fresh and processed foods	K4	IV
CO5	Interpret the packaging designs and environmental issues in various packing techniques	K5	V
CO6	Determine the various laws relating to packaging industries and the importance of labels in the food packaging	K5	V

2. Syllabus

Unit I: Introduction to food packaging

-9 Hours

A. History, functions of Packaging –Types, Concepts, Significance, Testing & evaluation of packing media - retail packs (including shelf life evaluation) and transport packages. Packaging of food(s)- Fresh and processed, general characteristics

- B. Food products - General classification and packing types, varieties and trends. Storage, handling and distribution of packages (foods) - including palletisation & Containerization

Unit II: Packaging Materials

-9 Hours

- A.** An introduction to packaging materials, **Basic Packaging Materials – Paper, Wood, Plastics, Glass, Metal Containers (SS)** Packaging Films – Polyethylene, Cellophane, Aluminium foil, Laminates, New Polymeric Packaging Films, Shrink Film, Cling and Wrap Film, Edible Film.
- B.** Packaging Methods and Systems-Traditional Food Packaging, Retortable, Lined Cartons, Bag in Box Aseptic, Modified Atmosphere Packaging, Vacuum, Gas Packaging, Bio Based Packaging, Eco-friendly and Safe Packaging for Exports Ovenable Packages, Transport Packages, Packaging Equipments.

Unit III: Storage, Handling and Distribution of Packages

- 9 Hours

Shelf-Life Testing of Packaged Foods, Evaluation of Packaged Foods **Labeling – Definition, Purpose, Types, Materials, Adhesives (SS)** Food and Nutritional Labeling as per FSSAI specifications Packaging Laws and Regulations – National and International Specifications

Unit IV: Packaging of fresh and processed Foods

-9 Hours

Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. Liquid and powder filling machines – like aseptic system, form and fill (volumetric and gravimeter), bottling machines. Form Fill Seal (FFS) and multi-layer aseptic packaging machines.

Unit V: Packaging Design & Environmental Issues in Packaging

(10 Hours)

- A. Food marketing and role of packaging- bar coding, Migration in food packaging. FSSAI regulations for packaging and food labelling.
- B. **Packaging** - Laws & Regulations - FDA, PFA, Packaging Commodity Rules, Weight & Measures Act etc, Coding & marking including bar coding, Environmental & Eco issues and waste disposal.

Unit VI: Topics for Self-Study

Consumer awareness about packaging- influence of existing and new FMCG food products packaging on consumer buying behavior- consumer experience of purchasing packaged food products- how packaging can influence them to purchase their decision powers.

Reference Link:

<https://www.ukessays.com/essays/marketing/research-views-food-packaging-5714.php>

Text Books

1. Miquel Angelo P R C, Ricardo Nuno C P, Oscar Leandro D S R, Jose Antonio C T, Antonio Augusto V , 2016, Edible Food Packaging: Materials and Processing Technologies, CRC Press. Taylor & Francis, Boca Raton , FL
2. Luciano P, Sara L,2016, Food Packaging Materials, Springer chamHeidelberg, New York, Department of Food Science and Technology 39
3. Robertson, G.L. 2006 Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis
4. NIIR. (2003). Food Packaging Technology Handbook, National Institute of Industrial Research Board, Asia Pacific Business Press Inc.
5. Ahvenainen, R. (Ed.) 2003 Novel Food Packaging Techniques, CRC Press,

Semester: III	Course Code : P23FS3E2
Credits: 2	Hours/Week: 3

Course Outcomes:

After completion of this course the students will be able to

	Course Outcomes	K-Level	Unit Covered
CO1	Extend the knowledge in preservation, needs and in their principles.	K2	I
CO2	Utilize various food additives and techniques in surplus foods during season to avoid wastage.	K3	II
CO3	Compare and contrast the ancient and modern techniques of food preservation that helps in preventing food spoilage.	K4	III
CO4	Analyze the role of microbes in food spoilage and its effects on human.	K4	IV
CO5	List the preserved food products available in the market and the preservatives used with its uses.	K4	V
CO6	Apply the preservation techniques in preserving various foods to become a successful entrepreneur.	K3	V

SYLLABUS

UNIT I Preservation

-12 Hours

- A. History, importance.
- B. Definition, needs, principles of food preservation.
- C. Methods of low and high temperature.

- D. Dehydration – Types, objectives and principles of dehydration, steps involved in dehydration process, merits and demerits- effects on nutritive value in dehydrated foods.

UNIT II Food Additives

- 12 Hours

- A. Food additives – Definition; Preservatives – class 1 and class 2 preservatives, colours, flavouring agents, sweeteners, emulsifiers and stabilizers, leavening agents, antioxidants, flour improvers.
- B. Government regulations.

UNIT III Preservation Types

- 12 Hours

- A. Bacteriostatic – Dehydration-types of dehydration (Sun drying, spray drying) Pickling, Salting, Smoking, Freezing – slow and quick, merits and demerits.
- B. Bactericidal – Canning-steps involved in the process of canning, Irradiation, microwave cooking.

UNIT IV Food Spoilage

- 12 Hours

- A. Definition, role of microorganisms in food spoilage, types of food spoilage, causes of spoilage, factors affecting spoilage, kinds of spoilage – perishable and non-perishable.
- B. Anaerobic and aerobic microorganisms involved in food preservation – mold, fungi, bacteria.
- C. Remedial measures to be taken on spoilage.
- D. Storage conditions – storage conditions leading to food spoilage.

UNIT V Preserved Foods

- 12 Hours

- A. (i) Products using sugar - squash, jam, jelly
- B. (ii) Products using salt - tomato ketchup, pickles, chutneys.
- C. (iii) Preservation using vinegar
- D. (ii) Preparation of dehydrated products – papads, vathal, vadams and dehydrated vegetables.

Topics for self-study

Sl. No.	Topics	Reference
1	Walk-in refrigerators in Five-star hotels.	https://www.irl.co.in/products/walk-in-cooler.html
2	Conventional sun drying versus mechanized dehydration.	http://ecoursesonline.iasri.res.in/mod/page/view.php?id=111449
3	Natural food additives as antioxidants.	https://madridge.org/journal-of-food-technology/mjft-1-1000102.php
4	Fenugreek as a preservative.	https://www.freepatentsonline.com/6372220.html#

Textbooks

1. N.ShakuntalaManay&M.Shadaksharaswamy, "Foods Facts and Principles (III Revised Edition)", New Age International (P) Ltd. Publishers, New Delhi,2011.
2. M.Swaminathan., "Food and Nutrition", Bangalore Printing and Publishing Company, Bangalore,2010.
3. Serpil Sahin and ServetGulumSumnu Physical properties of Foods. Springer publications 2006).
4. Brown.A:Understanding Food-Principles and Preparation;2nd edition, Thomson Wadsworth. 2004.

References

1. Maria Parloa (2012), "Canned fruit, preserves and jellies: Household methods of preparation", Published by US department of Agriculture, Washington
2. M. Shafiur, Rahman (2017), "Handbook of food preservation," 2nd edition, CRC press.
3. Potter, N. and Hotchkiss HJ, Food Science, 5th edition, CBS Publisher, 2007.

Course Type: Core -VIII Theory	Course Title: Public Health Nutrition
Semester IV	Course Code: P23FS408
Credit:5	Hours / Week:6

Course Outcome:

On successful completion of the course the students will be able to

	Course outcomes	K- Level	Unit Covered
CO1	Identify the role of nutrition in national development	K2	I
CO2	Acquire skill in assessment of nutritional status of community.	K2	II
CO3	Apply the knowledge on Strategies for Improving nutrition status and health status of the community.	K3	III
CO4	Evaluate the role organization in combating malnutrition.	K4	IV
CO5	Develop skills in preparation of communication aids and planning nutrition education programme for the community.	K5	V
CO6	Plan a holistic knowledge base on the importance of understanding the nutrition problems and their prevention.	K5	I-V

Syllabus

UNIT I Concept Of Public Nutrition

- 18 Hours

- Nutrition and Health in National Development
- Relationship between health and nutrition, National Health Care Delivery System, Determinants of Health Status, Indicators of Health.

- Nutritional deficiency disorders in India -Prevalence, Etiology, Symptoms, Current status and Recent updates- PEM, VADD, IDD, Anemia.
- Nutrition and infection
- Role of public nutritionists in the health care delivery system.

UNIT II Assessment Of Nutritional Status

- 18 Hours

- **Direct methods: Direct** methods of Nutritional assessment, Nutritional anthropometry, biochemical, clinical and dietary assessment and Growth charts- plotting of growth charts, growth monitoring and promotion (GMP).
- **Indirect methods:** Demography, population dynamics and vital health statistics and their health implications. Food balance sheets, recent nutritional assessment methods- MUST, SGA, SOAP. Indicators of health and nutrition. Causes of Malnutrition- Vicious cycle of malnutrition
- Basic concepts of Nutritional Surveillance- Millennium Development Goals (MDG)

UNIT III

Strategies For Improving Nutrition Status And Health Status Of The Community

- 18 Hours

- Immunization:** Awareness, types of vaccines, Importance and schedule of Immunization.
- Measures to overcome malnutrition in India**
- Food Security** -Concepts, Meaning and significance, Food security act. Food fortification and Food enrichment, Genetic improvement of foods, National nutrition policy and action plan
- Nutrition intervention programmes** - Mid day Meal Programme, Balwadi Feeding Programme. Public Distribution System (PDS),

Antyodaya Anna Yojana (AAY), Annapurna Scheme, Food for Work Programme, Special Nutrition Programme,

- E. **Nutrition Intervention Schemes and programmes operating in India-** Control programmes - Vitamin A, Anemia, Goiter, Malnutrition. Environmental sanitation and health

UNIT IV Organizations To Combat Malnutrition and nutrition During Emergencies And Special Conditions -18 Hours

- **International organizations** concerned with food and nutrition
FAO, WHO, UNICEF, CARE, AFPRO, CWS, CRS, World Bank.
- **National organization** – NIN, CFTRI, ICMR, ICAR, CFTRI, CHEB, NIPCCD, DFRL, NGOs.
- **Nutritional deficiency diseases in emergencies-** Major and micro nutrient. Control of communicable diseases in emergencies- Factors responsible for spread of communicable disease, mode of transmission and prevention of chicken pox, malaria, swine flu, tuberculosis, COVID-19 and AIDS.

Nutritional requirement for space mission, sea voyage and army.

UNIT V Nutrition Education And Extension Of Better Nutrition- 18 Hours

- A. **Nutrition education for the community** –Objectives, Definition and Importance of nutrition education to the community, Principles of planning, executing and evaluating nutrition education programmes.
- B. **Development and Use of AV aids in Public Nutrition Education.** -Charts, flip chart, posters, flannel board, models, OHP.

Unit VI Topic of Self Study

1. Planning and evaluation of nutrition education programmes in community. Preparation of communication aids for different groups.
2. Development of low-cost recipes for infants, pre-schoolers, elementary school children, adolescents, pregnant and lactating mothers.
3. Field visits to ongoing national nutrition programmes

Textbooks

1. Park, K. Text Book of Preventive and Social medicine. M/s. Banarsidas Bhanot Publishers, Jabalpur. 22nd Edition. 2013.
2. Suryatapa Das, Textbook of Community Nutrition. Academic Publishers, Kolkata. 4th Edition, 2020.
3. Srilakshmi, B Nutrition Science. New Age International Publishers. Multi Colour 6th Edition. 2017
4. Connolly, M.A. Communicable Disease Control in Emergencies: WHO, WHO Library Cataloguing-in-Publication Data. 2005.
5. WHO, The management of Nutrition in Major Emergencies. Published by AITBS Publishers, New Delhi. 2002.

References

1. MuthuVK A Short Book of Public Health, Jaypee Brothers Medical Publishers. 2nd edition, 2014.
2. Dr. Srridhar Rao B, Principles of Community Medicine, AITBS Publishers India. 6th edition. 2018
3. Scott M. Smith, Sara R. Zwart and Martina Heer Human Adaptation to Space Flight: The role of nutrition. NASA Publication. 2014.
4. Owen, A.Y. and Frackle, R.T., (2002). Nutrition in the Community. The Art of Delivering Services. Times Mirror/Mosby. 2nd Edition.
5. Carolyn D. Berdanier Johanna T. Dwyer David Heber (2014). Handbook

of Nutrition and Food, CRC Press, New York. Third Edition.

E-Learning Resources:

<https://apps.who.int/iris>

<http://egyankosh.ac.in/bitstream/123456789/33312/1/Unit-18.pdf>

https://www.seafarerswelfare.org/assets/documents/ship/SHIP-HealthyFood_A5_20151209_LR.pdf

Course Type:Core Practical - IV	Course Title :Food Analysis Practical
Semester IV	Code : P23FS4P4
Credits :5	Total Hours : 6

Course Outcomes

On completion of this course the students will be able to:

CO.No	Course Outcomes	Level	Unit Covered
CO1	Illustrate the relationship between body composition and fitness	K2	I
CO2	Compare and contrast the metabolisms with reference to fitness	K4	II
CO3	Determine the relationship between exercise and prevention of disease and disorder	K5	III
CO4	Assess the role of energy balance and electrolyte balance with reference to physical activity	K5	IV
CO5	Interpret the nutritional requirements for male and female sports persons	K5	V
CO6	Determine the nutritional requirement for fitness and physical performance	K5	V

Syllabus:

1. Estimation of **moisture** in dehydrated powders
2. Estimation of **carbohydrate** by Anthrone method
3. Estimation of **minerals** in flour – Calcium, Iron and Phosphorus
4. Estimation of **beta carotene** in carrot, Sweet potato and pumpkin
5. Estimation of **ascorbic acid** in Green Leafy Vegetables
6. Estimation of **fibre** in vegetables – Crude and Dietary
7. Estimation of **protein** in pulses by Kjeldhal Apparatus
8. Estimation of **cholesterol** by Zak's method

9. Estimation of **fat** in dehydrated powders using Soxhlet apparatus
10. Determination of **Peroxide value, Iodine and Saponification number** in fats and oils

Reference Books

1. A. Frank, Settle, Editor, "Handbook of Instrumental Techniques for Analytical chemistry", ISBN 0-13-177338-0.
2. S.M Knopkar, Basic concepts of Analytical Chemistry," Basic concepts of Analytical Chemistry. New Age International (P) Ltd., Publishers
3. R S Khandpur, Handbook of Analytical Instruments, 3rd editions. Skoog, Holler, Crouch. "Principles of Instrumental Analysis ", Seventh Editions.

Course Type: Elective VI Theory	Course Title : Advanced Food Service Management
Semester IV	Code: P23FS4:A
Credits: 3	Hours/ Week: 4

	Course Outcomes	K-Level	Unit Covered
CO1	Overview the food service management and techniques of menu planning	K2	I
CO2	Acquire skill in purchase storage and food production	K3	II
CO3	Apply the food management in food service establishment.	K2	III
CO4	Compile the work safety and laws governing	K4	IV
CO5	Develop skill in starting own food service establishment	K5	V
CO6	Discuss on operating procedures, potential hazards in food production, food safety regulations.	K5	

Syllabus

UNIT I History, Development Of Food Service System, Menu planning - 12 Hours

- A. History and development, recent trends, types of food service establishments, commercial establishments, non-commercial establishments, understanding management, approaches to food

service management

- B. Menu planning – importance, definition, need use and function
Knowledge and skills required for planning menu
- C. Types of menu and its applications
- D. Steps in menu planning and its evaluation, construction of menu, characteristics of a good menu, displaying a menu and evaluation of menu.

UNIT II Purchase And Storage, Quality And Food Production -12 Hours

- A. Mode of purchasing, centralized purchasing, group purchasing, methods of purchasing, identifying needs and amounts to buy, minimum stock level, maximum stock level, receiving and inspecting deliveries storage space, dry storage, low temperature storage, store room management
- B. Production control, use of standardized recipes, developing a program for recipe standardization, safeguard in food production, quality control in food preparation and cooking.

UNIT III Food Management: Delivery And Service Styles - 12 Hours

- A. Methods of delivery service system- centralized delivery system, decentralized delivery system, conventional food service system, commissary food service system - ready prepared food service system, assembly service system.
- B. Different types of service in food service establishments- table and counter service, self-service, tray service, types of service in a restaurant, silver service, plate service cafeteria service, and buffet service. specialized forms of service, hospital tray service, airline tray service, rail service, home delivery, catering and banquet, floor/room service, lounge service.

UNIT IV Personnel Management, Work Place Safety. - 12 Hours

- A. Definition of leadership, components approaches, qualities, leadership styles recruitment, selection and induction ,Employee facilities and benefits , laws governing employees, work productivity improvement

measures , Training and development.

- B. Hygiene and sanitary practices, types of accidents , precautions to prevent accidents , Garbage and refuse sanitation- inside and outside storage , Pest control- pests, signs of infestation and Integrated Pest Management (IPM) Laws governing food service establishment.

UNIT V Setting Up and Planning Food Service Unit -12 Hours

- A. Layout and design – Phases of planning layout-developing a prospectus, Determining work centers equipment , Factors influencing layout design, Architectural features, evaluation of plan , Energy and time management .
- B. Planning- steps and types of planning, Preparing a planning guide , Registration of unit , Application for a licence , Rules regarding grading of hotels and restaurants, Loan facilities for start up.

UNIT VI – Self Learning Topics

Hospital food service management-Tools for management in food service
Food supply chain management – Food cost analysis.

Textbooks

1. Bessie B and West Le Wood Food Service in Institutions (6th Ed.)
Macmillan Publishing Co. 1986
2. Mohini Sethi, Institutional Food Management, New age publications,
New Delhi, (2008)
3. June Payne-Palacio, Monica Theis, Foodservice Management: Principles
and Practices, Prentice Hall, 2011
4. Sudhir Andrews Food and Beverage Service- Training Manual, 23rd
Reprint, Tata McGraw Hill Publishing Co. (1997),
5. Food service management (2017) V Suganthi and C Premakumari.

References

1. Mohinder Chand, Managing Hospitality Operations, 2009, 1st Edition, Anmol Publications Pvt. Ltd. New Delhi.
2. Goel S.L, Health Care System and Hospital Administration, 2009, Vol.7, Deep and Deep Publications Pvt. Ltd.
3. Effective Food Service Management, Anmol publications Pvt Ltd, New Delhi, 2001.
4. Stephen, B, , Williams, S, R, "Bill Jardine, and Richard, J, N, Introduction to Catering,
5. Ingredients for Success, Delmar- Thomson learning, 2001.
6. Yadav, C, P. Management of Hotel and Catering Industry, Anmol publications Pvt.

E-Learning Source:

<https://seafoodacademy.org/pdfs/haccp-training-folder-contents-v2.pdf>

<https://psu.pb.unizin.org/hmd329/chapter/ch4/>

<https://www.plantautomation-technology.com/articles/types-of-food-processing-equipment>

<https://dmi.gov.in/GradesStandard.aspx>

<https://www.fssai.gov.in/cms/food-safety-and-standards-regulations.php>

Course Type : Elective–VI Theory	Course Title: Nutrition During Emergency
Semester : IV	Course Code :P23FS4:B
Credits : 3	Total Hours/ Week 4

Course Outcomes

On completion of this course the students will be able to:

	Course Outcomes	K-Level	Unit
CO1	Apply Millennium Goals Development in prevention of loss of lives in disaster	K3	I
CO2	Recommend special nutritional requirements for epidemic, endemic and pandemic conditions	K5	II
CO3	Prioritize the demand for food in the State and manage distribution to the diverse population based on the nutritional requirement	K5	III
CO4	Assess malnutrition in the affected population and recommend suitable mitigation programs	K5	IV
CO5	Analyze various laws and policies on disaster management	K4	V
CO6	Discuss the mitigation programmes and preventive measures required during emergency situations	K6	VI

Syllabus

UNIT I: Categorization of disasters leading to emergency situations

-12 Hours

- A. Definition of emergency situation /disaster — classification of emergencies – natural, man- made - Famine, drought, flood, earthquake, cyclone, war, civil and political emergencies.

- B. Factors leading to emergency conditions during disaster.
- C. History of emergency situations and disasters in Indian subcontinent – Gujarat earthquake, Surat plague, Chennai-Psunami etc.

Unit II: Health-related emergencies -12 Hours

- A. Epidemic diseases - Dengue, chikenguniya and other epidemic conditions.
- B. Endemic diseases - Hypothyroidism and hyperthyroidism.
- C. Pandemic diseases – SARS, COVID-19.

Unit III: Nutritional management during emergencies -12 Hours

- A. Nutritional relief and rehabilitation- Assessment of food needs, food distribution strategy, targeting food aid, mass and supplementary feeding, special foods/ rations for nutritional relief.
- B. Organizations for mass feeding/ food distribution, transportation and storage, feeding centers.
- C. Sanitation and hygiene and public nutrition approach to tackle nutritional and health problems in emergencies, ethical considerations.

Unit IV: Assessment and surveillance of nutritional status -12 Hours

- A. Malnutrition in emergency affected populations- Indicators of malnutrition during emergencies classification of malnutrition Body measurement indicators, clinical and other impacts
- B. Scope for malnutrition assessment, indicators and simple screening methods.
- C. Organization for nutritional surveillance.

Unit V: Food and Nutrition Security and disaster management programmes - 12 Hours

- A. Food production, Access, Distribution, Availability, Losses, Consumption.
- B. Food Security, Socio-cultural aspects and Dietary Patterns: Their implications for Nutrition and health.
- C. Disaster/emergency Management programmes in India & International - Disaster management acts & policies - Disaster Management Authority DMA (national, state, district, executive committees (national, state),

National & state disaster response force. United nation disaster management team- assessment and humanitarian affairs

Topics for self study –

Monitoring tools, Monitoring mechanisms to assess the adequacy of the ration, Access to other food sources in post-emergency phase, Self-reliance and exit strategies.

Text Book:

- A. Sharma S, Wadhwa A., “Nutrition in the Community- A textbook”, Elite Publishing House Pvt. Ltd, 2003.
- B. Srilakshmi B. “Dietetics” Seventh Edition, New Age International (P) Ltd, 2016.
- C. Park, K. TextBook of Preventive and Social medicine. M/s.BanarsidasBhanot Publishers, Jabalpur. 22nd Edition. (2013).
- D. Suryatapa Das (2020). Textbook of Community Nutrition.Academic Publishers, Kolkata. 4th EditionSrilakshmi, B (2017).
- E. Nutrition Science. New Age International Publishers. Multi Colour 6th Edition.

References

- A. MuthuVK (2014). A Short Book of Public Health, Jaypee Brothers Medical Publishers. 2nd edition.
- B. Dr. Srridhar Rao B (2018). Principles of Community Medicine, AITBS Publishers India. 6th edition.
- C. Scott M. Smith, Sara R. Zwart and Martina Heer (2014). Human Adaptation to Space Flight: The role of nutrition. NASA Publication.
- D. Owen, A.Y. and Frackle, R.T., (2002). Nutrition in the Community. The Art of Delivering Services. Times Mirror/Mosby. 2nd Edition.
- E. Carolyn D. Berdanier Johanna T. Dwyer David Heber (2014). Handbook of Nutrition and Food, CRC Press, New York. Third Edition.

Reference Link:

<https://www.unhcr.org/45fa745b2.pdf>

Course Type :SEC-I Theory	Course Title: Professional Competency in Food and Nutrition
Semester: IV	Course Code:P23FS4S1
Credits:2	Hours/ Week :4

Course Outcomes

On completion of this course, the student will be able to:

	Course Outcomes	K- Level	Unit Covered
CO1	Understand the basic concepts of quantitative aptitude.	K5	I
CO2	Gain in depth knowledge on various concepts of logical reasoning skills.	K4	II
CO3	Excel and able to solve aptitude and reasoning papers in campus interview.	K6	III
CO4	Acquire satisfactory competency in use of reasoning.	K6	IV
CO5	Compete efficiently in national and international level competitive exams.	K5	V
CO6	Evaluate data and information, apply critical thinking to solve problems and make decisions	K6	

Syllabus

Unit I- Quantitative Ability (Basic Mathematics)

-12 Hours

Number Systems, LCM and HCF, Simplification, Square Roots and Cube Roots, Average, Problems on Ages, Percentages, Problems on Numbers.

Unit II- Quantitative Ability (Advanced Mathematics)

- 12Hours

Probability, Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Time & Work, Ratio and Proportion.

Unit III- Data Interpretation**-12 Hours**

Tables, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Venn Diagrams

Unit IV Verbal and Non-Verbal reasoning**-12 Hours**

Analogy, Blood Relation, Directional Sense, Number and Letter Series, Coding –Decoding, Calendars, Clocks, Venn Diagrams, Mathematical Operations, logical sequence of work, Mirror-image, Water-image, Completion of incomplete pattern, Grouping of identical figures

Unit V - Logical Reasoning**- 12 Hours**

Statement – Argument, Statement Assumptions, Statement – Course of action, Statement and Conclusions, Cause and Effect reasoning, Deriving conclusion from passages, Theme detection.

Text Book

1. Aggarwal, R. S. (2000). *A Modern Approach to Verbal & Non Verbal Reasoning*. S.Chand.
2. Sijwali, B. S and Indu Sijwali (2014). *Analytical and Logical reasoning*, Arihant Publications.
3. Guha A, (2020) *Quantitative Aptitude by Competitive Examinations*, 7 th Edition, Mcgraw Hill Education Publication.
4. Rajgotra, A. & Pradhan P (2020). *Wileys Exam Xpert A simpler Approach to Logical Reasoning*, Willey Publications

References

1. Aggarwal, R. S. (2000). *A Modern Approach to Verbal & Non Verbal Reasoning*. S.Chand.
2. Sijwali, B. S and Indu Sijwali (2014). *Analytical and Logical reasoning*, Arihant Publications.
3. Guha A, (2020) *Quantitative Aptitude by Competitive Examinations*, 7 th Edition, Mcgraw Hill Education

Publication.

4. Rajgotra, A. & Pradhan P (2020). Wileys Exam Xpert A simpler Approach to Logical Reasoning, Willey Publications

E – Learning Resources

1. <https://prepinsta.com/>
2. <https://www.indiabix.com/>
3. <https://www.javatpoint.com>