MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI – 12

M.Sc., NUTRITION & DIETETICS

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,

CHENNAI – 600 005

FROM THE ACADEMIC YEAR 2023 – 2024 onwards

M.Sc., NUTRITION & DIETETICS

SEMESTER - I

Course status	**Course Title**	Credits	Hours
Core-I	Advanced Food science	5	6
Core –II	Advanced Human Physiology	5	6
Core-III	Nutrition Through Life Cycle	4	6
Core- I Practical	Advanced Food Science practical	2	4
Elective - I	Food processing and technology/ Principles of Menu Planning	2	4
Elective - II	Food processing and technology- Practical	2	4
	Total	**20**	**30**

SEMESTER - II

Course status	**Course Title**	Credits	Hours
Core IV	Research Methods in Nutrition	5	6
Core V	Advanced Dietetics	5	6
Core VI	Advanced Dietetics- Practical	4	6
Elective III	Nutritional Biochemistry	3	4
Elective IV	Perspectives of Homescience	3	4
Skill Enhancement Course [SEC] - I NME	Nutrition in Special Condition	2	4
	Total	**22**	**30**

SEMESTER - III

Course status	Course Title	Credits	Hours
Core VII	Food Quality Control	5	6
Core VIII	Macronutrients	5	6
Core IX	Resource Management	5	6
Core X (Industry Module)	Nutrition for Fitness	4	6
Elective V	Research Writing and Presentation	3	3
Skill Enhancement Course - II	Techniques in Food analysis	2	3
	Internship / Industrial Activity	2	-
	Total	**26**	**30**

SEMESTER - IV

Course status	Course Title	Credits	Hours
Core XI	Micronutrients	5	6
Core XII	Food Biotechnology	5	6
Core XIII	Project Work with Viva voce	7	10
Elective VI	Entrepreneurial Development	3	4
Skill Enhancement Course – III / Professional Competency Skill	Diet and Nutrition Counselling	2	4
Extension Activity		1	-
	Total	**23**	**30**

Total Credits - 91

ADVANCED FOOD SCIENCE

CREDIT: 5
SEMESTER :1
YEAR :1

COURSE OBJECTIVES:

To enable the students
Gain knowledge on the source and properties of food
Familiarize students with changes occurring in various foodstuffs as a result of processing and cooking.
Enable students to use theoretical knowledge in various applications and food preparations.

COURSE OUTCOME:

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

CO No.	CO Statement
CO1	Overview the relationship between the chemical structure and the properties of the main components in food like starch, protein and lipids.
CO2	Understand the Composition and characteristics of various food commodities.
CO3	Explain the cooking quality of foods and apply food science knowledge in food industries
CO4	Identify and understand the nutrients and functions of foods in maintaining health
CO5	Analyze the proper use of food colors and food additives in safe food preparation.

UNIT I

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.

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

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.
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

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.

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

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

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

UNIT V

Food additives- Definition, different food additives and Need for food additives. Flavour compounds in vegetables, fruits and spices; Effect of processing on food flavours; Role of colours and flavours in food products.
Sweetners- Properties, Artificial and Natural sweetners and role of sweetners in food industry.

TEXT BOOKS:

Srilakshmi B. (2015). Food Science.New Age International (P) Ltd.
Publishers.
S.M. Reddy (2015). Basic Food science and technology. New Age International
publishers.AvantinaSharma (2017).Text book of food science and Technology. CBS Publisheres and distributes ltd. 3rd Edition.
Swaminathan A.(2018) . Handbook of Food and Nutrition, Bangalore press.
Serpil Sahin and ServetGulumSumnu.(2006).Physical properties of Foods.
Springer publications

REFERENCES:

Gerard L. Hasenhuettl , Richard W. Hartel. (2019).Food Emulsifiers and Their Applications.Springer publications. 3rd edition.
Vickie.A. Vaciavik. (2021). Essentials of Food science. Springer publications. 5th edition.
Dr.M.Swaminathan.(2015). Advanced text book of Food and Nutrition. volume-2.Bapco publications.

Eskein.(2012). Biochemistry of Food. Elsievier publications.
Lyn O brienNabors.(2001).Alternative Sweetners. Taylor and Francis publications.
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

Mapping CO with PSO

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	3	2
CO2	3	3	3	2	1	2
CO3	3	3	3	3	3	2
CO4	2	3	3	2	1	3
CO5	3	3	3	2	2	3
Average	2.8	3	2.8	2.2	2	2.4

PEDAGOGY:
Lecture, Case study, journal reviewing, Assignments, Group discussion, Power point presentation

ADVANCED HUMAN PHYSIOLOGY

CREDITS: 5
SEMESTER :I
YEAR :I

Objectives:
This course will enable students to:
Advance their understanding of some of the relevant issues and topics of human physiology.
Enable the students to understand the integrated function of the system Understand alterations of structure and function in various organs and systems in disease conditions**.**

COURSE OUTCOME:
On successful completion of the course the student will be able to-

CO No.	CO STATEMENT

CO 1	Develop insight of normal functioning of all the organ systems of the body and their interaction. Understand the current state of knowledge about the functional organization of Human Cell and Histology.
CO 2	Understand the structural and functional organization of Blood and Cardiac System
CO 3	Understand the structural and functional organization of Respiration, Immunity and Endocrine GIT and Urinary System
CO 4	Comprehend the structural and functional organization Digestive System and Reproductive System
CO 5	Understand the structural and functional organization of Skin, Nervous and Excretory system

UNIT I
Cell

- 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

- 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

- 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

- 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

- 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.

TEXT BOOKS

- K. Sembulingam&PremaSembulingam (2019), Essentials of Medical Physiology. Jaypee publications. Eighth edition.
- Waugh A, Ross and Wilson (2018). Anatomy and Physiology in Health and Illness. Elsevier publications. 13ed.
- CC Chatterjee (2020). Human Physiology. CBS publishers. 13 ed.
- Indu Khurana (2020). Medical Physiology for Undergraduate Students. Elsevier Publication. 2 Edition.
- GK Pal (2019). Textbook of human physiology, Elsevier publications. 3edition.

REFERENCES:

- Guyton, A.G. and Hall, J.B. (2005): Text Book of Medical Physiology. W.B.Sanders Company, Prism Books (Pvt.) Ltd., Bangalore. 9th Edition.
- Wilson, K.J.W and Waugh, A. (2003): Ross and Wilson Anatomy and Physiology in Heathand Illness. Churchill Livingstone. 8th Edition.
- Jain, A.K.: Textbook of Physiology. Avichal Publishing Co., New Delhi. Vol.I and II.
- McArdle, W.D., Katch, F.I. and Katch V.L(2001): Exercise Physiology. Energy, Nutritionand Human Performance. Williams and Wilkins, Baltimore. 4th Edition.
- Ganong, W.F. (1985): Review of Medical Physiology. lange Medical Publication. , 12th Edition.
- Moran Campell E.J., Dickinson, C.J., Slater, J.D., Edwards. C.R.W. and Sikora, K. (1984): Clinical Physiology. ELBS, Blackwell Scientific Publications. , 5th Edition.
- McArdle, W.D., Katch, F.1. and Katch, V.L. (1996): Exercise Physiology. Energy, Nutrition and Human Performance, Williams and Wilkins, Baltimore. 4th Edition.
- Jain, A.K.: Textbook of Physiology. Avichal Publishing Co., New Delhi. Vol. I and II.
- Winword. Sear's Anatomy and Physiology for nurses. London, Edward Arnell.
- Chatterjee ChandiCharan : Text Book of Medical Physiology,London W.B.

E LEARNING CONTENT

https://youtu.be/MZDy0RvA52Y-Osmosis https://youtu.be/TgcyiVQnVBs- Respiratory system
https://youtu.be/44B0ms3XPKU- nervous system

Mapping: (CO/PSO)

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	1	3	3	2	3
CO2	3	1	3	3	2	3
CO3	3	1	3	3	2	3
CO4	3	1	3	3	2	3
CO5	3	1	3	3	2	3

PEDAGOGY
Lecture, Power Point Presentation, Demonstration, Group Discussion, Assignment, Library Visits, Seminars and Oral & Written Revision

NUTRITION THROUGH LIFE CYCLE

CREDITS: 4
SEMESTER :I
YEAR :I

LEARNING OBJECTIVES

To enable the students to

1. Understand the importance of nutrition through various life stages
2. Determine nutrient needs for all age groups and calculate the basic nutritional requirements
3. Develop a plan of action and implement nutritional care plan for every age group

COURSE OUTCOME

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

CO	CO STATEMENT
CO1	Recall prenatal and neo natal growth and development. Understand the foetal origins of adult disease. Identify the causes of intrauterine growth defects. Interpret the growthchart and analyze the growth and development of infants. Evaluate the nutritional needs of infants. Develop balanced diet charts and low cost supplementary foods
CO2	Recall the growth and development during childhood. Identify the food and nutrient needs. Implement the development of healthy gut micro biome during childhood. Analyze the factors affecting optimum growth and development. Evaluate the causesof nutritional disorders and methods of treatment. Create innovative and nutrient dense packed lunch menus. Develop diet charts for children with special needs.

CO3	Recall the definition of adolescent. Understand the growth and development of adolescent. Identify their food and nutrient requirements. Recognize the causes for their food habits and irregular meal pattern. Analyze the eating disorders and evaluate the pros and cons of fad diets. Examine the causes of problems during adolescence. Construct innovative balanced menus.
CO4	Recall the food and nutrient requirements and understand the physiological changes during pregnancy and lactation. Identify the factors influencing fertility and interpret pregnancy outcomes. Discuss the discomforts and complications during pregnancy and lactation. Examine the role of hormones in lactation and evaluate the composition of breast milk. Explain COVID protocols to be followed during this period. Create balanced diets based on recommended dietary guidelines
CO5	State the food and nutrient requirements during adulthood and old age. Recognize the need for dietary modifications during this period. Implement the dietary guidelines in creating menu plans. Analyze their constraints and develop strategies to overcome them.

Unit I

Prenatal and Infant nutrition

a. Foetal origins of adult disease, intrauterine growth retardation, low birth weight, cleft palate, foetal alcohol syndrome – causes and consequences.
b. Infancy – current feeding practices and nutritional concerns, guidelines for feeding normal and low birth weight infants. Growth and nutritional assessment – Growth chart, LBW babies – characteristics andnutritional care.

Nutritional assessment, nutrient needs, lactose intolerance, infantformula – types, complementary foods- liquid, semi-solid and solid foodchoices, special nutritional concerns in infant feeding. Feeding the premature infant, allergies and infant obesity. Develop low cost supplementary foods.

Unit II

Nutrition during childhood

a. Childhood – Growth and development, food and nutrient needs, dietary adequacy. Factors influencing food choices, food acceptance, parental influences. Development of healthy gut micro biome. Aetiology and treatment of PEM, Vitamin A Deficiency, Anaemia. Planning meals for children with Attention-deficit/hyperactivity disorder (ADHD), autism and dyslexia. Immunization schedule for children.
b. School age - Growth and development, food and nutrient needs, dietary adequacy. Food choices, meal patterns, prevention of nutrition andhealth problems. Causes and consequences of stunting, underweight, wasting, overweight, obesity and dental caries.

Packed lunch – dietary guidelines and nutritional requirements. Planning packed lunch for various income groups.

Unit III

Nutrition during adolescence

a. Growth and development, food and nutrient requirements
b. Food habits, irregular meal pattern, peer pressure, eating disorders. Pros and cons of popular fad diets. Planning balanced diets for adolescents.

Causes, consequences and treatment of adolescent pregnancy, PCOD,hormonal imbalance, premenstrual syndrome, anaemia, underweight, obesity.

Unit IV

Nutrition in Pregnancy and Lactation

a. Maternal nutrition– Factors influencing fertility, food and nutrient requirements, Effects of nutritional deficiencies during pregnancy, Physiological changes, weight gain during pregnancy, typical food preferences, PICA

Effects of smoking, drugs and alcohol on stages of foetal growth and pregnancy outcome. Complications and discomfort during pregnancy - Nausea, vomiting, constipation, heart burn, PIH, eclampsia, pre-eclampsia and gestational diabetes.

c. Lactation and breast milk – Physiology of lactation. Nutritive value and composition of breast milk - Colostrum. Food and nutrient requirements for nursing mother, advantages of breast feeding, importance of breast feeding over formula feeds. Public health measures for pregnant and lactating women. Complications during lactation.

COVID protocols for pregnant and lactating women. Planning balanceddiets for pregnant and lactating women.

Unit V

Nutrition in Adulthood and Old Age

a. Food and nutrient requirements during adulthood. Nutritional concerns in adulthood related to nutrient deficiencies.Signs and symptoms of menopause.Effect of occupational hazards, stress related disorders and lifestyle modifications to overcome them.
b. Geriatric nutrition - Food and Nutritional requirements - Nutritional care of the elderly. Physiological changes affecting digestion and absorption. Food selection patterns of the elderly. Nutritional problems of old age.

Planning balanced diets for adults and elderly based on special needs and requirements.

REFERENCES

BOOKS

- Nix .S 2016, Williams' Basic Nutrition & Diet Therapy, Fifteenth Edition, Elsevier.
- Simon Langley-Evans, 2015 Nutrition, Health and Disease: A Lifespan Approach 2nd Edition, Wiley Blackwell.
- Jacalyn J. McComb, Reid Norman, et al.,The Active Female: Health Issues Throughout the Lifespan 2010, Human press.
- Aleta L. Meyer and Thomas P. Gullotta., Physical Activity Across the Lifespan: Prevention and Treatment for Health and Well-Being (Issues in Children's and Families' Lives), 2012, Springer.
- Antia, F.P., 1992, Clinical Dietetics and Nutrition Oxford University Press, New

Delhi.

- Corinne, R.H., 1996, Normal and therapeutic nutrition, Mcmallian Co., New York.
- Davidson, S.R. and Passmore J.F., 1989, Human Nutrition and Dietetics, ELBS London.
- Mahan, K.L., and Stump, S.E., 1996, Krauses Food, Nutrition and Diet therapy M.B. Saunders Co., USA.
- Balasubramanian et al., 1998, Dietary guidelines for Indians, ICMR, New Delhi.
- Passmore, AH and Adams, A.A., 1990, Clinical assessment of nutritional status – A working manual, Will and Wilson Publishing, London.
- Bamji et al(1996), Textbook of Human Nutrition Oxford and IBH Publishing co. Pvt. Ltd. Delhi.
- Shils.E.M, Shike .M, Ross. A.C, Cabellero.B and Cousins.R.J (2011) Modern Nutrition in Health and Disease, Eleventh Edition, Lippincott Williams and Wilkins, Philadelphia.
- Mahan, K.L., and Stump, S.E., 1996, Krauses Food, Nutrition and Diet therapy M.B. Saunders Co., USA.

E- LEARNING RESOURCES

- www.four-h.purdue.edu
- www.ingenta.connect.com
- nal.usda.gov/fnic/lifecycle
- www.fda.gov/search.html
- http://epgp.inflibnet.ac.in/Home/ViewSubject?catid=1827

MAPPING OF CO WITH PSO

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	S	S	S	S	S	S
CO2	S	S	S	S	S	S
CO3	S	S	S	S	S	S
CO4	S	S	S	S	S	S
CO5	S	S	S	S	S	S

ADVANCED FOOD SCIENCE PRACTICAL

CREDIT: 2
SEMMESTER :1
YEAR :1

COURSE OBJECTIVES:

Comprehend the knowledge gained on characteristics and properties of foods during cooking
Apply the properties of food in various food processing and preparations Analyse the factors affecting cooking quality of foods
Create appropriate food preparation and processing methods to ensure quality standards.

COURSE OUTCOME:

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

CO No.	CO Statement
CO1	Gain knowledge on sensory analysis and cereal cookery concept
CO2	Understand the properties of various food.
CO3	Analyze the cooking quality of foods and apply knowledge in food industries.
CO4	Identify and understand the Physical characteristics.
CO5	Revise appropriate food preparation and processing methods to ensure standards in food industry.

UNIT -1

1. Sensory method –
   Analysis of taste sensitivity-Threshold test Duo –Trio test
   Multiple sample difference
2. Starch
   Microscopic structure and gelatinization.
   Factors affecting gelatinization –sag test.
   Gluten formation

UNIT -2

1. PULSE
   Factors affecting cooking quality
2. FRUIT
   Enzymatic browning Pectin test
   Firmness of gel

UNIT -3

1. VEGETABLE

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

2. MILK

Detecting the presence of starch, soda, starch, urea in milk sample. pH of milk sample.

Effect of acid on milk Maillard reaction.

UNIT -4

1. 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.

2. 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.

UNIT -5

1. PHYSICAL PROPERTIES

a. Thousand grain weight
b. Thousand grain volume
c. Hydration capacity
d. Hydration index
e. Swelling capacity
f. Specific gravity
g. Seed displacement test
h. Viscosity - Line spread test, Viscometer. 2.Adulteration

TEXT BOOKS:

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

REFERENCES:

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

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

Mapping of CO with PSO:

CO/PSO	PSO1	PSO2	PSO3	PSO 4	PSO 5	PSO 6
CO1	3	3	2	3	3	2
CO2	3	3	3	2	3	3
CO3	3	2	3	3	3	3
CO4	3	3	3	2	2	3
CO5	3	3	2	3	3	2
Average	3	2.8	2.6	2.8	2.8	2.6

PEDAGOGY

Experiments, Planning recipes, Group Discussion, Assignments, .

FOOD PROCESSING AND TECHNOLOGY

CREDIT: 2
SEMMESTER :1
YEAR :1

COURSE OBJECTIVES:

To enable the students:

1. Understand the science behind processing of foods and its impact on nutritive value of food stuffs.
2. Acquire in-depth knowledge on production of processed food products and the waste utilization techniques.
3. Understand the changes in physicochemical properties of foods due to processing condition.
4. Understand the various parameters related to post-harvest technology.

COURSE OUTCOME:

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

CO No.	CO Statement
CO1	The concepts and principles of food processing.

CO2	The various processed food products from plant and animal sources.
CO3	The by-products utilization from food processing.
CO4	The systematic knowledge of basic and applied aspects in food processing and technology.
CO5	The various post-harvest technologies for different food products

UNIT-I

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

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

UNIT-II

Cereal Processing and Technology:

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

Millets: processing of millets;

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 physiochemical properties of cereal starch and protein due to processing.

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

Pulse Processing and Technology:

Dals, flours, protein concentrates, isolates and hydrolysates; Byproducts utilization; Effect of processing on nutritive value and physiochemical properties of pulses.

Nuts and Oil Seeds Processing and Technology:

Nuts Processing methods, Oil seeds processing: Oil extraction methods and refining process; byproducts utilization; Effect of processing on nutritive value and physiochemical properties of vegetable oils.

UNIT-III

Vegetables Processing and Technology:

Pigments: Classification, effects on processing of vegetables; Preliminary processing of vegetables;

Vegetable products: Fermented and nonfermented and its shelf life; Vegetable waste utilization; Effect of processing on nutritive value and physiochemical properties of vegetable

Fruits Processing and Technology:

Concept of maturity, ripening and senescence; Methods of fruit processing technologies: traditional and new methods.

Fruit products: fermented and nonfermented; Effect of processing on nutritive value and physiochemical properties of fruits;

Browning reactions: types and mechanism; prevention methods; Fruit waste utilization.

Milk Processing and Technology:

Milk types, composition, physiochemical properties; Milk processing- Separation, centrifugal process, natural creaming, pasteurization, sterilization, homogenization. Milk storage; Effects of processing on nutritive value and physicochemical properties of milk

UNIT-IV

Egg Processing and Technology:

Egg processing and storage; Effect of processing on nutritive value and physiochemical properties of eggs; changes in egg quality during storage and preservation methods.

Meat Processing and Technology:

Meat processing and storage; Factors influencing meat quality; Ageing and tenderization of meat.

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

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

UNIT-V

Introduction of post-harvest technology

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

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

TEXTBOOKS

Shakuntala Manay N ShadakCheraswamyM . (2004) Food Facts and Principles. New age publisher . 2nd edition.

Roday S. (2011) .Food Science. Oxford publication . 1st edition.

B Srilakshmi (2015)Food science. New Age Publishers. 6th edition. Fellows P.(2000). Food Processing Technology, 2nd Edition.

Woodhead Publishing Limited and CRC Press LLC. 1st edition.

Avantina Sharma. (2017).Text book of food science and Technology. CBS Publisheres and distributes ltd. 3rd edition.

REFERENCES

Raocg . (2006).Essentials of food process engineering . PHI learning private ltd.

Janet D Ward and Larry Ward.(2006). Principles of Food Science .

Stem Publishers. 4th edition.

Srivastava R P and Kumar S. (2006) Fruits and Vegetables Preservation- Principles and Practices. International Book Distributing Co. 3rd edition.

W B Crusess.(2004). Commercial Unit and Vegetable Products.

W.V. Special Indian Edition,PubAgrobios India . 2nd edition. Forsythe S J and Hayes P R (1998). Food Hygiene,

Microbiology and HACCP. GaitersburgMaryland Aspen.

Eskein .(2012). Biochemistry of Food. Elsievier publications. 1st edition.

E LEARNING RESOURCES:
http://www.fao.org/3/V5030E/V5030E00.htm https://fmtmagazine.in/fruits-vegetables-processing-technologies/ https://www.actioncontrelafaim.org/wp-content/uploads/2018/01/technical paper_phl.pdf https://www.nutsforlife.com.au/resource/nuts-and-processing/ https://www.fssai.gov.in/

MAPPING (CO/PSO):

CO/PO	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	2	2	2
CO2	3	3	2	2	3	2
CO3	2	3	2	1	2	2
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	2.8	3	2.6	2.2	2.6	2.4

PEDAGOGY:

Lecture, Journal Reviewing, Power point presentations, Assignments and Discussions

PRINCPLES OF MENU PLANNING

CREDITS:2
SEMESTER 1
YEAR :1

UNIT-I: RECOMMENDED ALLOWANCES

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

UNIT-II

Preschool -, Food habits and nutrient intake of preschool children. Dietary allowances and supplementary foods.
School going age -, Nutritional status of school children, school lunch program, factors to be considered in planning a menu, food habits and nutritional requirement, packed lunch.

UNIT-III

Adolescence: Changes of growth characteristics of adolescents. Nutritional needs of the adolescents.
Adults: Nutrition for adults. Basis for requirement. Nutrition and work efficiency.

UNIT-IV: NUTRITION IN PREGNANCY

ICMR Nutrient allowances, Dietary guidelines. Common nutrition related problem of pregnancy and Lactation.

UNIT-V

Geriatric -Nutrition allowances - Dietary Guidelines -- psycho social and economical factors affecting eating behavior.

Infant -Rate of growth, weight as the indicator, Nutrition allowances for the infants. Breast feeding. Weaning foods suitable for infants. Premature infant and their feeding infant formulas.

REFERENCES BOOKS

Nix .S 2016, Williams' Basic Nutrition & Diet Therapy, Fifteenth Edition, Elsevier.
Simon Langley-Evans, 2015 Nutrition, Health and Disease: A Lifespan Approach 2nd Edition, Wiley Blackwell.

Jacalyn J. McComb, Reid Norman, et al.,The Active Female: Health Issues Throughout the Lifespan 2010, Human press.
Aleta L. Meyer and Thomas P. Gullotta., Physical Activity Across the Lifespan: Prevention and Treatment for Health and Well-Being (Issues in Children's and Families' Lives), 2012, Springer.

Antia, F.P., 1992, Clinical Dietetics and Nutrition Oxford University Press, New Delhi.
Corinne, R.H., 1996, Normal and therapeutic nutrition, Mcmallian Co., New York.
Davidson, S.R. and Passmore J.F., 1989, Human Nutrition and Dietetics, ELBS London.
Mahan, K.L., and Stump, S.E., 1996, Krauses Food, Nutrition and Diet therapy M.B. Saunders Co., USA.
Balasubramanian et al., 1998, Dietary guidelines for Indians, ICMR, New Delhi.
Passmore, AH and Adams, A.A., 1990, Clinical assessment of nutritional status – A working manual, Will and Wilson Publishing, London.
Bamji et al(1996), Textbook of Human Nutrition Oxford and IBH Publishing co. Pvt. Ltd. Delhi.
Shils.E.M, Shike .M, Ross. A.C, Cabellero.B and Cousins.R.J (2011) Modern Nutrition in Health and Disease, Eleventh Edition, Lippincott Williams and Wilkins, Philadelphia.
Mahan, K.L., and Stump, S.E., 1996, Krauses Food, Nutrition and Diet therapy M.B. Saunders Co., USA.

E- LEARNING RESOURCES

- www.four-h.purdue.edu
- www.ingenta.connect.com
- nal.usda.gov/fnic/lifecycle

MAPPING (CO/PSO):

CO/PO	PSO 1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	2	2	2
CO2	3	3	2	2	3	2
CO3	2	3	2	1	2	2
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	2.8	3	2.6	2.2	2.6	2.4

PEDAGOGY:
Lecture, Journal Reviewing, Power point presentations, Assignments and Discussions

FOOD PROCESSING AND TECHNOLOGY PRACTICAL

CREDITS:2
SEMESTER 1
YEAR :1

1. Refrigeration and Freezing of fruits and vegetables.
2. Refrigeration and Freezing of meat and fish.
3. Sun and Oven drying of Fruits and Vegetables.
4. Preparation of Jam, Jelly, Syrup and Squash.

5. Preparation of pickles.

6. Visit to Canning and Bottling unit.

7. Visit to fish processing unit.

8. Visit to a food packaging unit.

COURSE OUTCOMES:

On completion of the course, students will be able to

CO 1. To develop the skill to analyze the quality like sugar such as jam, jelly etc.

CO 2. To explain the fermentation process such as canning and bottling unit .

CO 3. To analyze technologies in food preservation..

CO 4. To discuss preservation of foods by salt and acid.

CO 5. To evaluate the novel technologies in food preservation.

Mapping

Food Processing and Technology Practical											
CO	**PO**					**PSO**					
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**6**
1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
2	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**2**	**3**	**3**	**2**
3	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2**
4	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2**
5	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

RESEARCH METHODS IN NUTRITION

CREDIT :5
SEMESTER :2
YEAR :1

OBJECTIVES:

To provide students understandings about the basic concepts, approaches and methods in conducting research thereby enabling them to appreciate and critique the nuances of designing a research study as well the ethical dimensions of conducting researches.
To explain the importance of research in food science and nutrition.

To make students understand the types of tools applicable to research problem and develop skills of preparing out line of research work and construct common data collection tools.

COURSE OUTCOME:
On successful completion of the course the student will be able to

CO No.	CO STATEMENT
CO 1	Demonstrate knowledge of the scientific method, purpose and approaches to research and Become a qualified researcher.
CO 2	Identify and selection of the research sampling and scales of measurement
CO 3	Understand the types of tools applicable to research problem and develop skills of preparing out line of research work and construct common data collection tools
CO 4	Assess the numerical data for providing statistical evidences to support the research results and interpretation of data with the use of tables and pictorial representations
CO 5	Present research data in a scientific manner and Understand the key elements of a research report and various applications of computer in Nutrition research

Unit 1: Foundation of Nutrition Research

1. 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** – Pre-Experimental, Quasi Experimental, True Experimental and Statistical Experimental designs.
2. Need of Research in Food Science and Nutrition
3. Research Process-

- Selection and Formulation of Research Problem
- Objectives of Research: Explanation, Control and Prediction

- Hypothesis: Definition, Importance, Types and Errors - I & II
- Deciding Variables

Unit 2: Sampling and Sample Design

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

- Nominal Scale
- Ordinal Scale
- Interval Scale
- Ratio Scale

2. Non comparative Scales– Meaning and types

1. Continuous Rating Scale
2. Itemized Rating Scale

- Likert Scale
- Semantic Differential Scale
- Stapel Scale

Unit 3: Data Collection and Preparation

1. Data Collection – Tools –0 Primary Data

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

Secondary Data

1. Published Sources
2. Unpublished Sources
3. **Reliability and Validity** of Tools– Meaning
4. **Data Preparation Process –**

- Editing
- Coding
- Classification
- Tabulation

Unit 4: Statistical Methods

1. Parametric and Non-Parametric tests Difference and Applic

2. Data Analysis Process-

1. Descriptive Analysis-

- Graphical and Diagrammatic Presentations
- Central Tendency – Mean, Median & Mode
- Dispersion -Standard Deviation

2. Statistical Inference – Tests of Hypothesis

- t – test
- ANOVA – One Way & Two Way
- Chi- square test – Goodness of Fit &Test of Independence

Unit 5: Reporting the Findings and Computer Applications

1. 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, Scribbr

TEXTBOOKS

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

REFERENCES

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

Mapping: (CO/PSO)

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6
CO1	1	3	2	2	3	2
CO2	1	1	1	0	2	1
CO3	3	3	3	3	3	2
CO4	1	3	3	0	3	1
CO5	3	2	3	0	0	1
Average	**1.8**	**2.4**	**2.4**	**1**	**2.2**	**1.4**

PEDAGOGY

Lecture, Power Point Presentation, Demonstration, Group Discussion, Assignment, Seminars and Oral & Written Revision

ADVANCED DIETETICS

CREDIT: 5
SEMESTER :II
YEAR:1

COURSE OBJECTIVES:

To acquire Knowledge regarding the effect of various diseases on nutritional status and nutrient requirement
To understand the modifications in nutrients and dietary requirements for therapeutic condition.
To Learn recent concepts in dietary management of different diseases.

COURSE OUTCOME:

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

CO No.	CO Statement
CO1	Critique the Nutritional screening technique
CO2	Comprehend the current concepts of therapeutic diets and critically ill
CO3	Implement the dietary principles on various disorders.
CO4	Acquire the knowledge of diet counseling skills.

CO5	Apply the dietary principles to manage the lifestyle disorders in the society

UNIT I

Nutritional screening, Nutritional care process, Nutritional Assessment, Nutritional diagnosis , Nutritional Intervention , Monitoring and evaluation.

Basic concepts of diet therapy – Therapeutic adaptations of Normal diet, Principles and classification of therapeutic diets. Routine Hospital diets – Regular, soft, fluid diet

Nutritional Management in critical care -Nutritional screening and nutritional Status assessment of critically ill, Nutritional requirement according to the critical condition

Nutritional support systems: Enteral and parenteral nutrition support- Types, composition and complications.

UNIT II

Medical Nutrition therapy for gastrointestinal and liver disorders UpperGastrointestinal tract Diseases – Nutritional care and diet therapy in Diseases of oesophagus - Oesophagitis, Gastro esophageal refluxdisease[GERD] and Hiatus hernia.

Disorders of stomach: Indigestion, Gastritis, Gastric and duodenal ulcers, and dumping syndrome

Lower gastrointestinal tract Diseases/Disorders-Common Symptoms of Intestinal dysfunction - Flatulence, constipation, haemorhoids, diarrhoea, steatorrhoea, 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.

Diseases of the Liver- hepatitis, hepatic coma, cirrhosis, cholecystits, cholelithiasis and pancreatitis, Zollinger Ellison syndrome and Biliary dyskinesia.

UNIT III

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.

Medical Nutrition therapy for Rheumatic disease- Etiology, Pathophysiology of Inflammation of Rheumatic diseases, Rheumatoid Arthritis, Osteoarthritis and sjogren syndrome.

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

Nutritional Management on Weight imbalance -Regulation of food intake and pathogenesis of obesity and malnutrition and starvation; Weight Imbalance: prevalence and classification.

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.

Nutritional Management in metabolic disorders- Prevalence, Etiology, risk factors, complications and dietary modifications of diabetes mellitus.

UNIT V

Nutritional management of cardiovascular diseases-etiology, risk factors, clinical features and dietary

modifications of Dyslipidemias, Atherosclerosis , Hypertension, Ischemic heart disease, Congestive cardiac failure.
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.
Nutritional management in cancer- Pathogenesis and progression of cancer, types,Symptoms and Dietary management.

TEXT BOOKS:

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

REFERENCES:

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

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.

Mapping of Co with PSO:

CO/PSO	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	1	2
CO2	2	3	3	3	1	2
CO3	3	3	3	3	1	3
CO4	2	3	3	3	1	2
CO5	3	3	3	3	1	3

Average	2.6	3	2.8	3	1	2.4

PEDAGOGY

Lecture, journal reviewing, Assignments, Power point presentations, video presentations.

ADVANCED DIETETICS PRACTICALS

CREDITS :4
SEMESTER :II
YEAR : 1

COURSE OBJECTIVES:

To acquire Knowledge in planning diets for various disorders To gain knowledge in diet counselling and educating patients. To understand the therapeutic modifications of diet.

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

CO No.	CO Statement
CO1	Evaluate various therapeutic diets
CO2	Identify the requirements for disease conditions and critically ill patients.
CO3	Assess and plan the diets for various disease conditions.
CO4	Create Knowledge in nutrient calculations and dietary principles.
CO5	Design the personalized diets for different individuals in the society

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
   a. Celiac disease
   b. Lactose intolerance.
   c. GERD
   d. Peptic ulcer
   e. Hepatitis
   f. Cirrhosis
6. Planning and preparing diet for Pneumonia
7. Planning and preparing diet for Rheumatic arthritis
8. Planning and preparation of diet for Glomerulonephritis
9. Planning and preparation of diet for cancer according to the condition

10. Planning and Preparing diet for pre and post Bariatric surgery patients.
11. Assessment and planning diet for post burn condition.

TEXTBOOKS:

Stump SE.(2012).Nutrition and diagnosis related care. Lippincott Williams and Wilkins. Canada.7th edition.

Width.M&Reinhardt.T. (2018).The Essential Pocket Guide for Clinical Nutrition.Wolters Kluwer Publishers. 2nd edition.

Whitney EN and RolfesSR.(2002). Understanding Nutrition, 9th edition, West/Wordsworth.

Guthrie H.(2002). Introductory Nutrition. CV Mosby Co.St. Louis.

Elia M, Ljunggvist O, Stratton RJ, Lanham SA.(2013). Clinical Nutrition. The Nutrition Society Textbook.Wiley Blackwell Publishers.2nd edition. Mitch, W. and Ikizler, Alp.(2010). Handbook of Nutrition and the Kidney.Lippincott Williams and Wilkins, New Delhi.6th edition.

Mahan LK, Stump SE and Raymond JL.(2012). Krause's Food and Nutrition Care Process.Elsevier Saunders.Missouri.13th edition.

REFERENCES:

Gopalan C., Ram Sastri B.V. And BalSubramaniam S.C. (2006). Nutritive Value of Indian Foods. Hydrabad, National Institute of Nutrition. Indian Council of Medical Research.

Clinical Dietetics Manual.(2018). Indian Dietetic Association. 2nd edition. Peggy Stanfield.Y.H.Hui.(2010). Nutrition and Diet therapy. Jones and Bartlett publishers.

William's. (2012).Basic Nutrition and Diet therapy.14th Edition.

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.

Mapping: (CO/PSO)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6
CO1	2	3	3	3	1	2
CO2	3	3	3	3	1	3
CO3	3	2	3	3	2	3
CO4	3	2	3	3	3	2
CO5	3	3	3	3	3	3
Average	**2.8**	**2.6**	**3**	**3**	**2**	**2.6**

PEDAGOGY

Group Discussion, Case study, Assignments, Planning menus in charts

NUTRITIONAL BIOCHEMISTRY

CREDIT:3
SEMESTER :II
YEAR :I

COURSE OBJECTIVES

1. Understand the need for the study of biochemistry as the basis for nutritional sciences.
2. Make students aware of metabolism of proximate principles and others.
3. A basic understanding of the functions of biological systems in relation to Nutritional biochemistry.

COURSE OUTCOME:

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

CO No.	CO Statement
CO1	Understand the role of enzymes and co enzymes in biological oxidation.
CO2	Gain knowledge on metabolism and regulation of carbohydrate.
CO3	Understand the concept of metabolism and bioenergetics of lipids.
CO4	Discuss the classification, structure, organization and metabolic pathway of protein.
CO5	Comprehend the biological metabolism and functions of nucleic acid and understand recent concepts in biochemistry.

UNIT I

Biological oxidation and enzymes

Biological oxidation, Electron transport chain and Oxidative Phosphorylation. Enzymes –Definition, Types , mechanism of action, factors affecting enzyme activity, coenzyme, role of b vitamin as coenzyme.

Free radicals – definition, formation in biological systems. Antioxidants – definition, Role of antioxidants in prevention of degenerative disorders

UNIT 2

Metabolism of Carbohydrates: Glycolysis, The Citric Acid Cycleglycogenesis, glycogenolysis, gluconeogenesis, The Hexose Monophosphate Shunt and bioenergetics.

Hormonal regulations of blood glucose homeostasis

UNIT 3

Protein and amino acid metabolism

Classification of amino acids, Oxidative Deamination, decarboxylation, transamination and transmethylation of amino acids, urea cycle, biosynthesis of non-essential amino acids, catabolism of essential amino acids. Protein biosynthesis.

UNIT 4

Metabolism of Lipids:

Classification of fatty acid, Biosynthesis of fatty acids, beta oxidation of fatty acids and ketone bodies. Essential fatty acids – types and functions. Metabolism of phospholipids, and cholesterol. Lipo proteins – classification and function.

UNIT 5

Overview of intermediary metabolism of carbohydrates, protein and lipid. Hormonal regulation of carbohydrate protein and fat metabolism

Structural components and functions of nucleic acid, Structure of DNA, DNA Replication, RNA synthesis – types and functions and metabolism, translation.

Recombinant DNA technology, Metabolism of Xenobiotics, Nutrigenomics

TEXT BOOKS

1. Jain, J.L., Jain, S., & Jain, N., (2005). Fundamentals of Biochemistry. S. CHAND & COMPANY Ltd. Ram nagar, New Delhi-110 055. 6th revised edition.
2. Bettelheim, F. A., Brown, W. H., Campbell, M. K., & Farrell, S. O. (2009). *General, Organic & Biochemistry*. Brooks/Cole Cengage Learning.
3. Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2005). *Biochemistry*. Lippincott Williams & Wilkins, 6th Edition, Wolters Kluwer, London.
4. Talwar, G. P., & Srivastava, L. M. (2002). *Textbook of biochemistry and human biology*. PHI Learning Pvt. Ltd..
5. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2000): 25th Ed. Harpers Biochemistry.Macmillan worth publishers.

REFERENCE BOOK

1. Marshall, W. J., Lapsley, M., Day, A., &Ayling, R. (2014). Clinical Biochemistry E-Book: Metabolic and Clinical Aspects. Elsevier Health Sciences.
2. Bender, D. A. (2003). Nutritional biochemistry of the vitamins. Cambridge university press.
3. Albanese, A. (Ed.). (2012). Newer methods of nutritional biochemistry V3: With applications and interpretations. Elsevier.
4. Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2005). Biochemistry. Lippincott Williams & Wilkins.
5. Lieberman, M., & Ricer, R. E. (2009). Lippincott's Illustrated Q&A Review of Biochemistry. Lippincott Williams & Wilkins.

E-LEARNINGRESOURCES:

https://www.udemy.com/share/1027yA/ https://www.classcentral.com/course/swayam-biochemistry-5229

https://www.classcentral.com/course/edx-biochemistry-biomolecules-metho ds-and-mechanisms-12585

https://www.classcentral.com/course/swayam-experimental-biochemistry-12 909

https://youtu.be/y6YGZfcAegw

Mapping of CO with PSO:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO 6
CO1	3	3	2	1	1	3
CO2	3	3	2	1	1	3
CO3	3	3	2	1	1	3
CO4	3	3	2	1	1	3
CO5	3	3	3	1	1	3
Average	**3**	**3**	**2.2**	**1**	**1**	**3**

PEDAGOGY (TEACHING METHODOLOGY):

Group Discussion, Case study, seminar, journal reviewing, Assignments, Power point presentations.

PERSPECTIVES OF HOME SCIENCE

CREDIT:3
SEMESTER :II
YEAR :I

COURSE OBJECTIVES:

On successful completion of these units, students are expected :

- To describe the importance of each branch of Home Science
- To understand the essence of each subject
- To prepare them for UGC NET, SLET and ASRB

COURSE OUTCOME:

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

CO No.	CO STATEMENT
CO 1	Understand the concept of Extension Education and its importance
CO 2	Comprehend the key aspects of human growth and development and realize the importance of mastering developmental tasks of each life span stage
CO 3	Understand the basic concepts of Textile and Clothing
CO 4	List personal goals and values, set living standards
CO 5	Understand the meaning of Guidance and Counselling and Career perspectives in Home Science

UNIT – I Extension Education

a. Meaning, Definition, objectives, characteristics, principles
b. Extension teaching methods- types and methods
c. Qualities of a good Extension Worker
d. Communication, Innovation and Social change

UNIT – II Human Development

a. Growth, Development, Maturation and Learning
b. Principles and Developmental stages &Task
c. Parental Disciplinary Techniques – merits and demerits
d. Early Childhood Education – Objectives. Types of Nursery Schools.
e. Exceptional children – Deaf, Blindness, Physical Impairment, Mental Retarded and Giftedness . Rehabilitation.

UNIT – III Textiles and Clothing

a. Classification and General properties textile fibres.
b. Processing and manufacture of Cotton, Silk, Wool and Rayon fibres.
c. Yarn: Classification.
d. Fabric construction - woven, non-woven and knitted fabric
e. Clothing: selection for the family.

UNIT – IV Family Resource Management

a. Home Management – Meaning, objectives and process
b. Resources - Classification and characteristics
c. Time, Money and Energy management
d. Decision making - Steps and Methods of resolving conflicts
e. Work simplification - Importance of work simplification. Mundel's classes of Change
f. Principles and Elements of Interior design, Various colours and colour schemes.

UNIT – V-Guidance and Counselling

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

TEXTBOOKS:

1. Jha, J.K. (2002). Encyclopaedia of Teaching of Home Science, Vol.I,II and III . New Delhi: Anmol Publications.
2. Suriakanthi.A., (2002). Child Development - An Introduction Gandhigram: Kavitha Publications.
3. Srilakshmi.B. (2015). Food Science. New Delhi. New Age International Pvt.Ltd. 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, McGraw Hill India.
4. Rani K. Sudha and Srivastava Sushila, Textbook of Human Development: A lifespan development approach, S. Chand & Co Ltd.

Mapping: (CO/PSO)

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	1	3	3	1	3
CO2	3	2	3	3	2	3
CO3	3	2	3	3	1	3
CO4	3	2	3	3	1	3
CO5	3	1	3	3	1	3
Average	**3**	**1.6**	**3**	**3**	**1.2**	**3**

PEDAGOGY

Lecture, Power Point Presentation, Demonstration, Group Discussion, Assignment, Library Visits, Seminars and Oral & Written Revision

NUTRITION IN SPECIAL CONDITION

CREDIT-2
SEMESTER-II
YEAR -I

Course objective
To acquire knowledge on physiological changes during extreme climatric changes.
To understand the diet pattern and food choice in special condition
To develop the skill of planning menu for military ration.

COURSE OUTCOME
Asses the physiological condition during special condition
Design a space food and military ration
Understand different techniques of maintain health in extreme condition
Comprehend the dietary requirements of various climatic condition
Plan a balanced diet for polar , hot and sea voyage condition

UNIT 1 Space Nutrition
Physiological changes during space flight, types of space food, essential quality and criteria required for space food

UNIT 2 Nutrition in extreme condition
Physiological changes , Nutritional requirement in cold polar and hot environment , food supplements .

UNIT 3 Sea voyage
Stress in daily life aboard, Legal background for catering , cause of malnutrition in sea voyage, Limitation in food choice and diet pattern.

UNIT 4 Military Nutrition
Dietary guidelines , Food choice, nutrient supplements and ration developed in militaty

REFERENCES
Jacalyn J. McComb, Reid Norman, et al.,The Active Female: Health Issues Throughout the Lifespan 2010, Human press.
Aleta L. Meyer and Thomas P. Gullotta., Physical Activity Across the Lifespan: Prevention and Treatment for Health and Well-Being (Issues in Children's and Families' Lives), 2012, Springer.
Antia, F.P., 1992, Clinical Dietetics and Nutrition Oxford University Press, New Delhi.
Corinne, R.H., 1996, Normal and therapeutic nutrition, Mcmallian Co., New York.

Mapping of Co with PSO:

CO/PSO	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	1	2
CO2	2	3	3	3	1	2
CO3	3	3	3	3	1	3
CO4	2	3	3	3	1	2
CO5	3	3	3	3	1	3

Average	2.6	3	2.8	3	1	2.4

PEDAGOGY

Lecture, journal reviewing, Assignments, Power point presentations, video presentations.

FOOD QUALITY CONTROL

CREDITS:5

SEMESTER:III

YEAR:II

LEARNING OBJECTIVES (LOs)

- Provide adequate theoretical background and understanding about sensory evaluation of food.
- Enable students to use various sensory methods for evaluation variety of foods.
- Enable students to analyse and interpret sensory evaluation data.

Unit I

General principles of quality control – quality attributes - size, shape, colour, consistency, viscosity, texture, taste and flavour. Methods of evaluation of food quality – sensory, objective technique, micro biological methods of quality evaluation. General testing conditions – quantitative difference tests – designing of questionnaire (or) evaluation of scorecard.

Unit II

Food contaminants: Naturally occurring toxicants, anti-nutritional factors in foods. Environmental containments: Biological contaminants, Pesticide residues, veterinary drug residues and heavy metals.

Unit III

Direct Additive: Preservatives, Nitrate, Nitrite, and N-nitroso compounds. Indirect Additives, Anti-microbial and veterinary drugs, pesticides, poly halogenated aromatic hydrocarbons, polycyclic aromatic hydrocarbons. Other organic residues, packing materials, heavy metals, Radio nuclides in foods.

Unit IV

Common adulterants – tests to detect adulterants, Government and trade standards for quality – food laws and regulations – PFA, FPO and APEDA- BIS standards – Agmark standard – International Standards for export. HACCP – Food safety system.

Unit V

Laws and regulations for setting up a processing unit. FSSAI rules and regulations, FSSAI Licence , Registration, FSSAI in Food safety and Standards

Reference

1. Giridarilal Sidappa, G.S., and Tandon, G.L. (1979) Preservation of fruits and vegetables,ICAR, NewDelhi.
2. FPO (1955), QualityControl.

3. Horace, D.Graham, 1980, the safety of foods, 2nd End, AVI publishing Co.Inc, Westport.
4. Julie Miller Jones, 1992, Food Safety, Eagan Press, USA.

5. Lewis M.J. 1987, Physical properties of food and processing system, Ellis Harwood Ltd.,England.
6. Picgott, J.R, 1984, Sensory Analysis of Foods, Elsevier Applied Science Publisher, NewYork.

COURSE OUTCOMES:

On completion of the course, students will be able to

CO 1. Explain safety and quality management systems that ensure integrity through the food chain.

CO2. Discuss the practical applications of Laboratory Information Management Systems in the food industry.

CO 3. Understand the quality management standards, philosophies and frameworks.

CO 4. Students will know about risk management strategies employed in the food industry.CO 5. Understand about the key regulatory issues that ensure food safety and quality.

Mapping

Core – Food Quality Control											
CO	**PO**					**PSO**					
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**6**
1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2**
3	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**3**	**3**	**2**
4	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**3**	**3**	**1**
5	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**3**	**3**	**2**

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MACRO NUTRIENTS

CREDITS:5
SEMESTER :III
YEAR :2

OBJECTIVE:

To enable the students

- To understand the relationship between lipid, carbohydrate, protein and mineral metabolism.
- To learn about the therapeutic uses of carbohydrates protein and fat in prevention of non-communicable disease.
- To get insights in the inborn errors of metabolism

COURSE OUTCOMES:

After studying this paper, the students would know

CO No.	CO STATEMENT
CO1	The essentials of nutrients in growth and development of humans
CO2	The importance of major nutrients in maintaining human health and leading active lifestyle
CO3	The enhancement of nutritional quality of the diet.
CO4	Identify the various types & sources of food borne illness and methods of prevention.
CO5	The role of nutrients in health and diseases.

UNIT I:

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:

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:

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:

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, Hypocholesterolaemic foods – garlic, fiber and plant proteins.

UNIT V:

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,

TEXT BOOKS:

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

REFERENCES:

- Guthire, H.A., (2001). Introductory Nutrition. C.V. Mosby Company, St. Louis. Tenth edition.
- Bogert, J.G.V., Briggs, D.H., & Calloway, (2000). Nutrition and physical fitness. W.B. Saunders Co., Philadelphia, London, Toronto. 11th edition.
- Brown, J.E., (2002). Nutrition Now. Wadsworth Thomson Learning New York. 3rd edition.
- Toteja, G. S. (2004). *Micronutrient profile of Indian population*. Indian Council of Medical Research Publication, New Delhi.
- Swaminathan, M., (2002). Principles of Nutrition and Dietetics. BAPPCO, 88, Mysore Road. Bangalore – 560 018.
- Jain, J.L., Jain, S., & Jain, N., (2005). Fundamentals of Biochemistry. S. CHAND & COMPANY Ltd. Ram nagar, New Delhi-110 055. 6th revised edition.

E- LEARNING RESOURCES:

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

MAPPING (CO/PSO):

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	2	2	3	3	3	3
CO5	2	2	2	3	3	2
Average	**2.6**	**2.6**	**2.8**	**3**	**3**	**2.8**

PEDAGOGY:

Lecture, Journal Reviewing, Power point presentations, Assignments and Discussions

RESOURCE MANAGEMENT

CREDITS:5
SEMESTER :III
YEAR :2

LEARNING OBJECTIVES

To enable the students to

1. Understand the Concepts, Significance and Principles of Resource Management.
2. Apply the skills in efficient use and management of time, energy and Money.
3. Understand Consumer behaviors, Problems and to learn the importance of consumerprotection.

COURSE OUTCOME

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

CO	CO STATEMENT
CO1	Identify and analyze the need for resources and apply decision makingskills.
CO2	Understand the role of resource and apply the same to prepare time plans.
CO3	Apply work simplification techniques for efficient use of energy.
CO4	Develop skills to prepare a budget within the available income and tomaintain accounts.
CO5	Highlight the need of consumer protection by understanding andidentifying the consumer behavior & problems.

UNIT I

Management Process – Definition, concept, characteristics, Motivating factors in management – Values, Goals and Standards. Management process - Planning, Organizing, Controlling and Evaluation.

Decision making - Meaning and its importance, Kinds of decisions, Steps in Decision making process, Factors affecting Decision making process, Methods of resolving conflicts.

UNIT II

Resources - Definition, Role of resource in management, Classification of resources, Factors affecting the use of resources, Maximizing the use of family resources, Conservation of resources.

Time management – Definition, concept, Tools in time management - Peak loads, WorkCurve and rest periods. Time management process – Steps in making time plans - Controlling the planning action - Evaluation. Time demands during different stages of the family life cycle.

UNIT III

Energy Management - Energy requirements for household activities, Fatigue-concepts, Types - Physiological and Psychological fatigue, Remedies to overcome fatigue and Management process applied to energy.

Work Simplification - Definition, Importance, Techniques – Formal and Informal Techniques - Mundel's Classes of change.

UNIT IV

Money management – Concept of Income, Sources and types of family income, Methods of supplementing family income, Steps in money management, Methods of handling money income, Budgeting, Steps in making budget, Controlling the use of income, Types of Records, Evaluation, Savings and its advantages.

UNIT V

Consumer - Definition, Role, Rights and Responsibilities, Consumer behavior, Consumer problems, Education and Empowerment. Consumerprotection, consumer organization, cooperatives, alternative redressal,standardization, standard marks, quality control, buying aids, consumer legislation.

REFERENCES

1. Bela Bhargava (2005), "Family resource Management & Interior Decoration",university book house pvt ltd, ISBN-13: 978-8187339229
2. Marion Giordan (2016), "Consumer Education: A handbook for Teachers", Routledge;1st edition, ISBN-13: 978-1138839151
3. Nickell & Dorsey (2002), "Management in Family Living", CBS; 4th edition, ISBN-13: 978-8123908519
4. Rao (2020), "Taxmann's Human Resource Management", Taxmann Publications Pvt.Ltd.; 2nd edition, ISBN-13: 978-9390128396
5. Ready GB (2021), "EBC consumer Protection Act", LAW BOOKS, ASIN:B097TQ64QV
6. Seetharaman P, (2019), "An Introduction to Family Resource Management", CBS (11July 1905); 01149344934, ISBN-13: 978-8123911861
7. Steven, D.S, (2016). Consumer Economics: A Practical Overview", NewYork:Routledge Taylor and Francis group.
8. Sudhir Dixit (2018), "Time Management", Manjul Publishing House, ISBN-13: 978-9388241106

E- LEARNING RESOURCES

- Saviom (2022), "What is Resource Management and its Importance", https://www.saviom.com/blog/what-is-resource-management/
- Jason Westland (2022), "Resource Management: Process, Tools & Techniques", https://www.projectmanager.com/blog/quick-guide-resource-management
- eGyanKosh, "Work Simplification", file:///C:/Users/sysmz/Downloads/Unit-19%20(1).pdf

- Shalu Gupta, "Work simplification", http://homescience10.ac.in/storage/pages/ecurriculum/Bsc_Hsc_Sem_2/Work%20sim plification.pdf
- Consumer Education in Resource management, https://www.nios.ac.in/media/documents/srsec321newE/321-E-Lesson-17.pdf

MAPPING OF COs WITH PSOs

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	W	W	S	M	S
CO2	M	W	W	S	M	S
CO3	M	W	W	S	M	S
CO4	M	W	W	S	M	S
CO5	M	W	W	S	M	S

NUTRITION FOR FITNESS

CREDITS:4
SEMESTER :III
YEAR :2

LEARNING OBJECTIVES (LOs)

This course will prepare the students to:

- Understand the components of health and fitness and the role of nutrition.
- Make nutritional , dietary and physical activity recommendations to achieve fitness and well – being.
- Develop ability to evaluate fitness and well - being

Unit I

Definition, components and assessment criteria of age: Specific fitness and health status.Holistic approach to the management of fitness and health:
Energy input and output Diet and Exercise. Effect of specific nutritions on work performance and physical fitness, nutrition, exercise, physical fitness and health inter-relationship.

Unit II

Different energy systems for endurance and power activity: Fuels and nutrients to support physical activity . Shifts in carbohydrate and fat metabolism, mobilization of fat stores during exercise. Nutrition inSports:
Sports specific requirement. Diet manipulation, Pre- game and post game meals. Assessment of different nutragenic aids and commercial supplements. Diets for persons with high energyrequirements, stress, fracture and injury.

Unit III

Significance of physical fitness and nutrition in the prevention and management of weight control ,fat reduction and obesity. Exercise and Weight control - fundamentals of aerobics, Nutrition guidance on balanced eating and nutritional advice to clients for obesity, skin nourishment, hair treatment.

Unit IV

Yoga- Meaning, Aims, Objectives, significance, Systems of Yoga - Eight limbs of yoga.

Unit V

Asanas - Classification, difference between physical exercise and yogic exercise, Guidelines for practicingAsanas. Meditation - Meaning, types, benefits.

References

1. B.K.S. Iyengar, Light on yoga, London University, in paperback, 1989.
2. Yogeshwar, Text Book of Yoga, Madras Yoga Centre.
3. K. Chandrasekaran, "Sound health through Yoga" PremKalyanPublication, Sedapatti, 1999.
4. Ira Wolinsky 1998 .Nutrition in Exercise and sports , 3rd edition, CRC Press.
5. Sizer, F.& Whitney , E(2000) Nutrition - Concepts & Controversies, 8thEdition , Wadsworth Thomson Learning.

COURSE OUTCOMES:

On completion of the course, students will be able to

CO 1. Identify the major muscle groups of the body that are used with cycling.

CO2. Students will acquire knowledge and demonstrate skills to safely engage in physical activity.

CO 3. Students will understand the principles of lifetime fitness and will incorporate fitness activities into ahealthy and active lifestyle.

CO 4. Students will use basic principles of health and wellness to develop an informed, personal approachto mental and physical health. Students will acquire knowledge and demonstrate skills to safely engage in physical activity.

CO 5. Students will demonstrate and value knowledge of psychological and sociological concepts, principles, and strategies that apply to physical activity and sport.

Mapping

Core – Nutrition for fitness											
CO	**PO**					**PSO**					
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**6**
1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2**
3	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**3**	**3**	**2**
4	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**3**	**3**	**1**
5	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**3**	**3**	**2**

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

RESEARCH WRITING & PRESENTATION

CREDITS:3
SEMESTER :III
YEAR :2

LEARNING OBJECTIVES

To enable the students to

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

1. Introduce the importance of critical inquiry as a way of gaining knowledge and adding to it through research.
2. Exposure to the various forms of research and research methodology processes.

COURSE OUTCOME

CO	CO STATEMENT
CO1	Demonstrate an understanding of the purpose and significance of research.
CO2	Formulate clear and focused research questions that address specific gaps or areas of inquiry within a given field of study.
CO3	Develop well-structured and reliable data collection instruments, such as questionnaires, interview guides, and observation protocols.
CO4	Analyze and interpret research findings accurately, considering the research objectives and the data analysis results.
CO5	Write clear, concise, and coherent reports that effectively communicate the intended message.

UNIT I

UNDERSTANDING RESEARCH Explore the purpose, significance and types of research, including qualitative, quantitative and mixed methods approaches.

UNIT II

RESEARCH QUESTIONS

Formulate clear and focused research questions. Develop skills in conducting a thorough literature review.

Research Ethics: Discuss the importance of ethical considerations in research, plagiarism avoidance and ensuring participant confidentiality.

UNIT III

DATA COLLECTION

Methods of data collection- Primary sources: observation and recording, interviews structured and unstructured, questionnaire, open ended and close ended questions and the advantages of the sampling. Collecting data from secondary sources.

UNIT IV

Data Analysis Techniques: Learn quantitative and qualitative data analysis techniques.

Results Interpretation: Develop skills in interpreting research findings and effectively communicating the significance and implications of the results.

UNIT V

REPORT WRITING

Writing Process: Understand the stages of the writing process, including prewriting, drafting, revising and editing, to produce coherent and well-structured research.

Citation and Referencing: Learn and apply appropriate citation styles, such as APA format.

REFERENCES

1. Panneer Selvam, Research Methodology, 2nd Edition, Asoke Ghosh publications, Delhi. 2014.
2. Pagadala Suganda Devi, Research Methodology A Handbook for Beginners, Notion Press 2017
3. Dr. Shanti and Dr. Shashi, Handbook of Research Methodology, Educreation Publishing, 2011
4. Linda Groat and David Wang, 'Architectural Research Methods', 2nd edition, John Wiley and Sons Inc, Hoboken, New Jersey, US, 2013.
5. Wayne C Booth, Joseph M Williams Gregory G. Colomb, 'The Craft of Research', 3 rd Edition, Chicago Guides to Writing, Editing and Publishing, 2008.
6. Iain Borden and Katerina Ruedi, 'The Dissertation: An Architecture Student's Handbook', Edition 2, Architectural Press, 2005
7. Ranjith Kumar, 'Research Methodology- A Step by Step guide for Beginners', 4th Edition, Sage Publications, 2014. 5. John W Creswell, 'Research Design: Qualitative, Quantitative and Mixed Methods Approaches', Sage Publications, 2013.
8. JA Smith, P Flowers, M Larkin, 'Interpretative Phenomenological Analysis: Theory, Method and Research (English),I Edition, Sage Publications, 2009.

E- LEARNING RESOURCES

- www.socialresearchmethods.net
- www.psych-it.com.au
- www.skillsyouneed.com
- https://southcampus.uok.edu.in/Files/Link/DownloadLink/RM%20U1%20P1.pdf
- https://ccsuniversity.ac.in/bridge-library/pdf/Research-Methodology-CR-Kothari.pdf
- https://www.researchgate.net/publication/303381524_Fundamentals_of_research_methodology_and_data_collection
- https://www.researchgate.net/publication/333015026_Chapter_3_-_Research_Methodology_and_Research_Method

MAPPING OF COs WITH PSOs

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	S	S	S	S	S	S
CO2	S	S	S	S	S	S
CO3	S	S	S	S	S	S
CO4	M	M	M	S	M	M
CO5	S	S	S	S	S	S

TECHNIQUES IN FOOD ANALYSIS

CREDITS:2
SEMESTER:III
YEAR:II

OBJECTIVES:

To enable students to:

Learn the techniques of estimating the quantity of different nutrients present in food.

To enable the students to get practical experience in the laboratory and develop the skills to undertake research work

COURSE OUTCOME:

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

CO No.	CO STATEMENT
CO 1	Understand safety rules for the laboratory and demonstrate various instruments used for food analysis.
CO 2	Acquire skills to prepare and standardise various solutions to conduct experiments for food analysis.
CO 3	Acquire skills in ashing of foods and prepare ash solution to analyse mineral contents in food.
CO 4	Demonstrate quantitative analysis of various nutrients in foods i.e. crude fibre, moisture, Vit -C, calcium, phosphorus, iron, etc.
CO 5	Demonstrate experiments to check estimation of protein, fat content and Pigment Analysis

Unit – 1

1. **Introduction to Laboratory Practices**
2. **Instrumental Techniques –**

- Autoclave
- Hot Air Oven
- pH Meter
- Electronic Weighing Balance
- Centrifuges
- Hot Plate
- Spectrophotometer
- Water Bath
- Muffle Furnace
- Viscometer
- IR Moisture Analyzer
- Colorimeter

Unit – 2

Preparation and Standardisation of Solution

Unit – 3

Ashing of Food (Thermogravimetric Method**) and Preparation of Ash Solution**

Unit – 4

Food Analysis Experiments – Estimation of –

Moisture Content – Thermogravimetric Analysis -Air Oven Method and Infrared Radiation(IR) Moisture Analyzer Method

- Crude Fibre–Gravimetric Method
- Iodine Number of oils – Wij's Method
- Acid Number of oils - Titrimetric Method
- Peroxide Value of oils - Titrimetric Method
- Ascorbic Acid – 2, 6- Dichloroindophenol Titrimetric Method
- Calcium -Precipitation Titrimetric Method
- Iron – Wong's Method
- Phosphorus–Colorimetric Method

Unit – 5

Demonstration Experiments

- Estimation of protein content in food by Kjeldahl method
- Estimation of fat content in food by Soxhlet method
- Pigment Analysis by Paper Chromatography Techniques

TEXT BOOKS AND REFERENCES:

S. Suzanne Nielsen (2017). Food Analysis Laboratory Manual. Springer International Publishing. Third Edition.
S. Suzanne Nielsen (2017). Food Analysis. Springer International Publishing. Fifth Edition.
Otles, S. (2005). "Methods of Analysis of Food Components and Additives" CRC Press, USA.
Ranganna, S. (2001). "Handbook of Analysis and Quality Control for Fruit and Vegetable Products". Tata-McGraw- Hill, India. 2nd edition.
Sadasivam, S and Manickam, A (1997). "Biochemical Methods". New Age International Publishers, New Delhi. 2nd Edition.
Jayaram, I, (1996), "Laboratory Manual in Biochemistry", New Age International Publishers, New Delhi. Fifth ed.
Raghuramulu, N, Nair K.M &Kalayanasundaram, S.A, (1983), "Manual of Laboratory Techniques", National Institute of Nutrition, ICMR.

Mapping: (CO/PSO)

CO/PSO	PSO	PSO	PSO	PSO	PSO	PSO
	1	**2**	**3**	**4**	**5**	**6**
CO1	3	2	3	0	3	2
CO2	2	3	3	0	3	1
CO3	2	3	3	0	3	1
CO4	3	3	3	1	3	3
CO5	3	3	3	1	3	3
Average	**2.6**	**2.8**	**3**	**2**	**3**	**2**

PEDAGOGY

Demonstration, Experiments, Activities as assignment, Group Discussion, Observation and Interpretation

MICRONUTRIENTS

CREDITS: 5
SEMESTER :IV
YEAR :II
COURSE OBJECTIVES

1. To enables the students to learn the functions, deficiency symptoms, food sources and requirements of the different micro nutrients.
2. To Gain knowledge of nutrients requirement and management of micronutrients during various stages of life and disease
3. To gain insight about recent concept and findings in field of nutrition and application of the same to prevent disease

COURSE OUTCOMES:
On completion of the course the students will be able to…

CO No.	CO Statement
CO1	Evaluate the specific role of functional foods and nutraceuticals in prevention of degenerative disease.
CO2	Understand the importance of micronutrients in growth and development of humans.
CO3	Analyse the importance of diet in maintaining human health to combat nutrient deficiency in the community
CO4	Gain in-depth knowledge of the physiological and metabolic functions of vitamins and minerals and their implications
CO5	Analyse the recent advances in the field of micronutrient and research for the welfare of the community

UNIT I:
Distribution in the body; functions, effects of deficiency, food sources, requirement and recent research of macro minerals - Calcium, Phosporous, Magnesium, Potassium, Sodium and Chloride.
UNIT – II
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:
Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of Fat Soluble Vitamins A,D,E and K
UNIT IV:
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 B 6, choline and inositol.
UNIT V:

RECENT CONCEPTS IN NUTRITION:

Immuno-nutrients and Antioxidants

Definition, classification and function of functional food and nutraceuticals. Antinutrients present in various food groups – Cereals , legumes and nuts and oilseeds

Food and drug interaction.

TEXT BOOKS

Guthrie, H.A. (2001) – "Introductory Nutrition", Tenth edition, C.V. Mosby Company, St. Louis.

Bogert, J.G.V., Briggs,D.H, Calloway, (2000). " Nutrition and physical fitness", 11th edition W.B. Saunders Co., Philadelphia, London, Toronto.

Wardlaw, G.M and Kessel, M, (2002) " Perespective in Nutrition", 5thedition, Mc Graw Hill, New York, New Delhi.

Willium, S. R. (2000), " Nutrition and Diet Therapy", Mosby Co., St. Louis.

Sizer, F.S and Whitney E. R. (2003), " Nutrition , Concepts and Controversies" 9th edition, Thomas Wadsworth, Australia.

REFERENCE BOOK

Brown, J.E. (2002), "Nutrition Now", 3rd edition, Wadsworth Thomson Learning New York.

Maurice, E. Shils, James A. Obson, Moshe shike, (2000), " Modern Nutrition in Health and Disease", 8th Edition, Vol I and II, Lea &Febiger Philadelphia, A Waverly Company.

Mahan L.K. and Stamp, S.E (2000), "Krause's Food Nutrition and Diet Therapy", 11th edition, W.B. saunder's Company, Philadelphia.

Toteja, G.S and Singh P (2004), " Micronutrient Profile of Indian Population", ICMR Publication, New Delhi.

D. M. Swaminathan (2002), " Principles of Nutrition and Dietetics", BAPPCO, 88, Mysore RoadBangalore – 560 018.

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

Mapping: (CO/PSO)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	2	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	2	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	2	3
Average	**3**	**3**	**3**	**3**	**2**	**3**

PEDAGOGY (TEACHING METHODOLOGY):

Group Discussion, Case study, seminar, journal reviewing, Assignments, Power point presentations.

FOOD BIOTECHNOLOGY

CREDITS: 5
SEMESTER :IV
YEAR :II

Objectives ofthe course

To enable the students to :

1. To develop students knowledge, understanding and skills infood biotechnology.
2. To enhance students ability to identify current and future research directions in food biotechnology

UNIT-I

Important industrial microorganism. Media for industrial fermentations, criteria used in media formulation, medium composition–energy, carbon, nitrogen and other growth factors–buffering and antifoam agents. Production of culture, maintenance and preparation, bacterial culture, yeast culture and mold culture.

UNIT-II

Food Fermentation–Batch and continuous process, Ferment or design–solid substrate fermentation, downstream processing, instrumentation and control. Alcoholic beverages: Beer, wine: Non alcoholic beverages: tea, coffee, cocoa, Dairy products.

UNIT-III

Fermented vegetables-sauerkraut, soya based foods – tofu, temphe, yogurt; meat fermentation- sausage; Vinegar. Development of novel sweeteners, production of fats- Lard, amino acids-L-aspartate, Development and formulation of probiotic foods. Isolation & purification of starch, Starch in food industry, Modification of starch. Isolation of protein from soyabean, milk, egg; Protein hydrolysates; Modification of protein.

UNIT-IV

Enzyme technology in food industry: industrial enzymes andits applications (with respect to food processing industry). Micro encapsulation, List of industrial enzymes and their applications in food industry, Production of food industrial enzymes. Immobilization of enzymes- method of immobilization,

advantage and disadvantage ofimmobilization. Uses of immobilized enzymes-High fructose corn syrup preparation.

UNIT-V

Ethical issues concerning GM foods; testing for GM foods; current guidelines for the production, release and movementof GM foods; labeling and traceability; trade related aspects;biosafety; risk assessment and risk management. Public perception of GM foods. IPR. GMO Act 2004. (Genetically Modified Crops Management Act 2004).

Reference Books

1. Gupta,P.K.(1996),ElementsofBiotechnology,RostogiAndCo,Meerut.
2. Paul, P.C. and Palmer (1972) Food Theory And application John Wiley Sons, NewYouk 3.GaryWalshAndDenisR.Headen,ProteinBiotechnology,S.ChandAn dCo,Ltd,NewDelhi.
4. Dubey,R.C.AndMaheswari,D.K.A.TextBookofMicrobiology,S.Cha ndAndCo,Ltd,NewDelhi.
5. FoodScienceAndFoodBiotechnology,2003,GustaraF.Gutierrez-Lopez.
6. Lee,B.H.FundamentalsofFoodBiotechnology.VCH.2006.

Website ande-learning source

- https://g.co/kgs/5J7wnE
  https://content.kopykitab.com/ebooks/2016/07/8081/sample/sample_8081.pdf

COURSE OUTCOMES

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

CO No.	CO Statement
CO1	Identify the Media composition & production culture.
CO2	Identify the composition & production culture.
CO3	Apply Modification of starch & protein, development of novel sweeteners.
CO4	Appraise Enzyme technology, micro encapsulation.
CO5	Interpret GM Foods production, biosafety & risk management.

MAPPING (CO/PSO):

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	**3**	**3**	**3**	**3**	**3**	**3**

PEDAGOGY:

Lecture, Journal Reviewing, Powerpoint presentations, Assignments and Discussions

ENTREPRENEURIAL DEVELOPMENT

CREDITS:3
SEMESTER:IV
YEAR:II

COURSE OBJECTIVES

To enable the students to

1. Understand basic concepts in entrepreneurship.
2. Acquire knowledge about the various Entrepreneurial development agencies.
3. Adopt key steps in the elaboration of business ideas.
4. Understand major steps involved in setting up a Small-Scale Unit.
5. Highlight the Legislation process and Labor Laws Application.

COURSEOUTCOMES

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

CO	CO STATEMENT
CO1	Discern distinct entrepreneurial traits.
CO2	Explain business idea generation techniques, Evaluate parameters to assess opportunities and constraints for new business ideas and device a business plan. Discuss ownerships and SHG
CO3	Explain financial, working capital and marketing management
CO4	Identify and include Major steps involved in setting up a Small-Scale Unit Elaborate Export Marketing procedures& formalities and learn about Patents & IPRs
CO5	Analyze Legislation process and explain the Labor Laws Application

Unit I

Entrepreneurship–Basicconcepts

Entrepreneurship–Definition,Importance,Challengesanditsrelevanceincareergrowth StartupsIndia–IncubationCentre-Digitalentrepreneurship&Socialentrepreneurship, Entrepreneur-Meaning and Characteristics.

Unit II

Business Idea and Self-Help Groups

Business Idea Generation Techniques–Identification of Business Opportunities Ownership-partnership, soleproprietorship,franchise,cottageindustries,self-employment SHG–Meaning, Importance and Government Assistance

Unit III

Financial and Marketing Management

Financial Management-Books of Accounts,FinancialStatements,WorkingCapitalManagement–Factorsand sources,Break-EvenAnalysisMarketing Management- Marketing Mix- Product, Promotion, Place &Price.

Unit IV

Setting up a Small-Scale Unit

Major stepsinvolved insettingupaSmall-ScaleUnitFinancialsupportfromFinancialInstitutes-National level -NBMSME, KVIC, DC-MSME, NSIC, NSTEDB, EDI, NI-MSME,NIESBUD,IIE,NABARD Statelevel-DIC,SFC,SIDC,SIADB,SIDBI, Export Marketing- procedures & formalitiesInventoryManagement&TQM BasicconceptsPatents& IPRs

Unit V

Legislation Formalities

Legislation-Licensing,Registration,MunicipalLaws,BusinessEthicsLaborLawsApplication, ConsumerComplaintsandRedressalTax–GSTanditsimplication.

REFERENCES

BOOKS

- Saravanavel,(2005), EntrepreneurialDevelopment,Ess Pee Key PublishingHouse,Chennai
- VasantDesai,(2004),ProjectManagement,HimalayaPublishingHouse.
- Holt(2009),Entrepreneurship, Newventurecreation.
- S.SainiandS.K.,Dhameja,(2011),EntrepreneurshipandSmallBusinessRawartNewDelhi.
- C.Jain,(2012),HandbookforNewEntrepreneurs,OxfordUniversityPress.

E-LEARNINGRESOURCES

- http://www.ddegjust.ac.in/studymaterial/mba/cp-401.pdf
- https://ecestudy.files.wordpress.com/2015/02/theories-of-entrepreneurship.pdf
- http://www.bimkadapa.in/materials/ED-5-UNITS-PDF.pdf
- https://www.theseus.fi/bitstream/handle/10024/115894/Laamanen_Pirita.pdf?sequence =1&isAllowed=y
- https://bbamantra.com/preparation-of-a-business-plan/
- https://courses.lumenlearning.com/boundless-business/chapter/introduction-toentrepreneurship2.http://www.rroij.com/open-access/women-entrepreneurs--problems-ofwomenentrepreneurs-.php?aid=48589–3.http://www.mbaexamnotes.com/business_idea.html
- https://www.businessstudynotes.com/finance/project-management/types-feasibility.

MAPPINGOFCOWITHPSO

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	W	M	W	M	S
CO2	M	S	S	S	S	S
CO3	M	M	M	M	S	S
CO4	M	M	S	M	S	S
CO5	M	S	S	S	S	S