ACHARYA NAGARJUNA UNIVERSITY

A State Government University, Accredited with "A" Grade by NAAC

Nagarjuna Nagar - 522 510, Guntur, Andhra Pradesh, India.

M.Sc. FOOD SCIENCE, NUTRITION & DIETETICS

SYLLABUS

2022 - 2023 onwards

UNIVERSITY COLLEGE OF SCIENCES

PROGRAM CODE:

ANUCS10


ACHARYA NAGARJUNA UNIVERSITY
సత్యం సర్వం ప్రతిష్ఠితమ్

ABOUT UNIVERSITY

ACHARYA NAGARJUNA UNIVERSITY (ANU)

- A Brief Profile

Acharya Nagarjuna University, a State University established in 1976, has been constantly striving towards achieving progress and expansion during its existence for over four decades, in terms of introducing new courses in the University Colleges, affiliated colleges and professional colleges. Spread over 300 acres of land on the National High Way (NH-16) between Vijayawada and Guntur of Andhra Pradesh, the University is one of the front ranking and fastest expanding Universities in the state of Andhra Pradesh. The University was inaugurated on 11th September, 1976 by the then President of India, Sri Fakruddin Ali Ahmed and celebrated its Silver Jubilee in 2001. The National Assessment and Accreditation Council (NAAC) awarded "A" grade to Acharya Nagarjuna University and also has achieved 108 International ranks, 39 National ranks UI Green Metrics rankings and many more It is named after Acharya Nagarjuna – one of the most brilliant preceptors and philosophers, whose depth of thought, clarity of perception and spiritual insight were such that even after centuries, he is a source of inspiration to a vast number of people in many countries. The University is fortunate to be situated on the very soil where he was born and lived, a soil made more sacred by the aspiration for light and a state of whole someness by generations of students. With campus student strength of over 5000, the University offers instruction for higher learning in 68 UG & PG programs and guidance for the award of M.Phil. and Ph.D. in 48 disciplines spread over six campus colleges and one PG campus at Ongole. It also offers 160 UG programs in 440 affiliated colleges in the regions of Guntur and Prakasam Districts. It has a Centre for Distance Education offering 87 UG & PG programs. Characterized by its heterogeneous students and faculty hailing from different parts of the state and the country, the University provides most hospitable environment for pursuing Higher Learning and Research. Its aim is to remain connected academically at the forefront of all higher educational institutions. The University provides an excellent infrastructure and on- Campus facilities such as University Library with over one lakh books & 350 journals; Computer Centre; University Scientific Instrumentation Centre; Central Research Laboratory with Ultra-modern Equipment; Well-equipped Departmental Laboratories; Career Guidance and Placement Cell; Health Centre; Sports Facilities with Indoor & Outdoor Stadiums and Multipurpose Gym; Sports Hostel; Separate hostels for Boys, Girls, Research Scholars and International Students; Pariksha Bhavan (Examinations Building); Computers to all faculty members; Wi-Fi connectivity to all Departments and Hostels; Canteen, Student Centre & Fast-food Centre; Faculty Club; Dr. H.H. Deichmann & Dr. S.John David Auditorium cum Seminar Hall; Post office; Telecom Centre; State Bank of India; Andhra Bank; Energy Park; Silver Jubilee Park; Fish ponds; internet center; xerox center; cooperative stores; Water harvesting structures.

VISION, MISSION & OBJECTIVES OF THE UNIVERSITY

ACHARYA NAGARJUNA UNIVERSITY

VISION

To generate sources of knowledge that dispels ignorance and establish truth through teaching, learning and research.

MISSION

To promote a bank of human talent in diversified faculties – Commerce & Management Studies, Education, Engineering & Technology, Humanities, Law, Natural Sciences, Pharmacy, Physical Education & Sports Sciences, Physical Sciences and Social Sciences that would become an investment for a prosperous society.

OBJECTIVES

- To inspire and encourage all who would seek knowledge through higher education and research.
- To provide quality instruction and research for the advancement of science and technology.
- To promote teaching and research studies in disciplines of societal relevance.
- To bridge the gap between theory and practice of the principles of higher education.
- To develop human talent necessary for the industry.
- To open up avenues of higher education and research through non-formal means.
- To invite and implement collaborations with other institutes of higher learning on a continuous basis for mutual academic progress.
- To motivate and orient each academic department/centre to strive for and to sustain advanced levels of teaching and research so that the university emerges as an ideal institute of higher learning.
- To focus specially on the studies involving rural economy, justifying its existence in the rural setting.

VISION

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MISSION OF THE COLLEGE

ACHARYA NAGARJUNA UNIVERSITY

UNIVERSITY COLLEGE OF SCIENCES

VISION OF THE COLLEGE:

University College of Sciences envisages to be a good team of people with scientific temperament, research bent and a flair for Teaching & Learning for the betterment of the Community, Society, State and the Country at large.

MISSION OF THE COLLEGE:

The College intends to incubate and nurture the Leaders, Mentors, Educators and researchers who can transform the country and contribute to advances in science while addressing the challenges faced by the society for the betterment of human life.

VISION & MISSION OF THE DEPARTMENT

ACHARYA NAGARJUNA UNIVERSITY

UNIVERSITY COLLEGE OF SCIENCES

DEPARTMENT OF FOOD SCIENCE, NUTRITION & DIETETICS

VISION OF THE DEPARTMENT:

The department improves human lifestyle and well –being of regional and local communities by prevention of diseases through effective application of knowledge of Food Science, Nutrition and Dietetics.

MISSION OF THE DEPARTMENT:

The mission of the department is to better human health in society by

- Contributing to the knowledge of nutrients and their functions at cellular, systematic and whole body levels.
- Providing innovative research and service programmes with the goal of improved health of families and communities
- Delivering knowledge to Post –Graduate students though high quality teaching, training and extension activities.

ACHARYA NAGARJUNA UNIVERSITY

UNIVERSITY COLLEGE OF SCIENCES

DEPARTMENT OF FOOD SCIENCE, NUTRITION & DIETETICS

PROGRAMME OUTCOMES (PO's):

After successful completion of the program, the student is able to:

S.No.	Program Outcomes
PO1	Apply knowledge of Food science, nutrition and dietetics to understand the chemical components- nutrients and non-nutrient constituents their physicochemical and functional properties, spoilage, processing, preservation, packaging of different foods.
PO2	To assess nutritional status of individuals in various life-cycle stages and determine nutrition-related problems and diseases.
PO3	Identify and understand different problems related to food science, food microbiology, food toxicology, food adulteration and nutritional problems in different stages of life in health and disease - its consequences and dietary management and apply knowledge to tackle these problems.
PO4	Design food products applying the principles of food science and nutrition to meet the challenges of nutritional problems and to suit demand of market at current scenario.
PO5	Conduct research in different fields of nutrition, food science, dietetics and other allied areas.
PO6	Apply appropriate techniques to design, process, preserve, analyze and authenticate the different components of foods and food products.
PO7	Function effectively in different facets as dietitian, quality control systems, food analysts, research and development, food product designing, different food service establishments, and policymaking
PO8	Communicate effectively Nutrition information in person and with community. Acquire skills in writing research report, documentation, case studies, seminar presentations, group discussions, and marketing strategies.
PO9	Describe social and environmental dimensions within nutrition and the life sciences. Able to demonstrate the National and International food laws, regulations and safety standards in application of food additives to ensure safe food.
PO10	Know Professional and social ethics as researcher, dietitian, community mentor, food business operator.

PO11	Apply knowledge of Nutrition and food science for sustainable development of the society in terms of socio cultural aspects, attitudes, and practice balanced diet in health and disease, food quality and safety regulations, food adulteration, food safety and hygiene.
PO12	Develop and design their own food business plan in terms of food business operators and food service establishments by using entrepreneurial skills.
PO13	Learn advanced concepts of Nutritional science at global perspective.
PO14	To promote student nutritional and health status along with family.
PO15	To help community in terms of health and nutritional status by organizing extension activities.

PROGRAMME SPECIFIC OUTCOMES (PSO's):

S.No.	Program Specific Outcomes
PSO1	Identify and select various sources of nutrient available in nature.
PSO2	Apply and incorporate the principles of nutrition and dietetics in community, hospital and real world situations and problems.

STRUCTURE

ACHARYA NAGARJUNA UNIVERSITY

UNIVERSITY COLLEGE OF SCIENCES

DEPARTMENT OF FOOD SCIENCE, NUTRITION & DIETETICS

COURSE STRUCTURE

SEMESTER-I

S.No.	Components of Study	Title of the Course	Title of the Paper	No. of Credits	Internal Assessment Marks	Semester end Examinations Marks	Total Marks	No. of hours / week
1.	**Mandatory Core**	**FSND1.1(22)**	Nutrition Through Life Cycle	4	30	70	100	
2.		**FSND1.2(22)**	Food Chemistry and Analysis	4	30	70	100	
3.	**Compulsory Foundation**	**FSND1.3(22)**	Clinical Nutrition and Dietetics	4	30	70	100	
4.	**Elective Foundation**	**FSND1.4(22) (a)**	Food Science and Experimental Foods	4	30	70	100	
		FSND 1.4 (b) (22)	Fundamentals of Nutraceuticals					
		FSND 1.4 (c) (22)	Community Nutrition					
5.	**Practical -I**	**FSND 1.5 (22)**		4	30	70	100	
6.	**Practical-II**	**FSND 1.6 (22)**		4	30	70	100	
TOTAL				**24**	**180**	**420**	**600**	

*** Elective Foundation – Choose one paper.**

SEMESTER-II

S.No.	Components of Study	Title of the Course	Title of the Paper	No. of Credits	Internal Assessment Marks	Semester end Examinations Marks	Total Marks	No. of hours/ week
1.	**Mandatory Core**	**FSND2.1 (22)**	Nutritional Biochemistry	4	30	70	100	
2.		**FSND2.2 (22)**	Food Processing and Packaging Technology	4	30	70	100	
3.	**Compulsory Foundation**	**FSND2.3 (22)**	Entrepreneurship Development	4	30	70	100	
4.	**Elective Foundation**	**FSND2.4(a) (22)**	Food Regulation and Quality Control	4	30	70	100	
		FSND (b) (22)	Nutrition in Emergencies & Disaster Management					
		FSND 2.4 (c) (22)	Applied Physiology					
5.	**Practical -I**	**FSND 2.5 (22)**		4	30	70	100	
6.	**Practical-II**	**FSND 2.6 (22)**		4	30	70	100	
7.	**Skill Development Course**			4	00			
TOTAL				**28**	**180**	**420**	**600**	

*** Elective Foundation – Choose one paper.**

SEMESTER-III

S.No.	Components of Study	Title of the Course	Title of the Paper	No. of Credits	Internal Assessment Marks	Semester end Examinations Marks	Total Marks	No. of hours/ week
1.	**Mandatory Core**	**FSND3.1 (22)**	Therapeutic Nutrition	4	30	70	100	
2.		**FSND3.2 (22)**	Food Microbiology and Toxicology	4	30	70	100	
3.	**Elective-I**	**FSND3.3(a) (22)**	Research Methodology	4	30	70	100	
		FSND 3.3 (b) (22)	Processing of Cereals, pulses and oil seeds					
		FSND 3.3 (c) (22)	Nutrition for health and fitness					
4.	**Elective-II**	**FSND 3.4 (a) (22)**	Nutraceuticals and Food Biotechnology	4	30	70	100	
		FSND 3.4 (b) (22)	Human Nutrition					
		FSND 3.4 (c) (22)	Food product Development & Marketing					
5.	**Practical -I**	**FSND 3.5 (22)**		4	30	70	100	
6.	**Practical-II**	**FSND 3.6 (22)**		4	30	70	100	
7.	**Skill Enhancement Course**			4	00	00		
TOTAL				**28**	**180**	**420**	**600**	

*** Elective I– Choose one paper** *** Elective II– Choose one paper.**

SEMESTER-IV

S.No	Components of Study	Title of the Course	Title of the Paper	No. of Credits	Internal Assessment Marks	Semester end Examinations Marks	Total Marks	No. of hours/ week
1.	**Mandatory Core**	**FSND 4.1 (22)**	Advanced Studies in Nutrition	4	30	70	100	
2.		**FSND 4.2 (22)**	Statistics and Computer Applications	4	30	70	100	
3.	**Elective-I**	**FSND 4.3(a) (22)**	Institutional Food Service Management	4	30	70	100	
		FSND 4.3(b) (22)	Geriatric Nutrition					
		FSND 4.3(c) (22)	aking Technology					
4.	**Elective-II**	**FSND 4.4(a) (22)**	Nutritional Status Assessment Methodologies	4	30	70	100	
		FSND 4.4 (b) (22)	Public Health					
		FSND 4.4 (c) (22)	Processing of Fruits and Vegetables					
5.	**Practical -I**	**FSND 4.5 (22)**		4	30	70	100	
6.	**Practical-II**	**FSND 4.6 (22)**		4	30	70	100	
7.	**Project work**			4	00	100	100	
TOTAL				**28**	**180**	**520**	**700**	

*** Elective I– Choose one paper** *** Elective II– Choose one paper.**

FIRST SEMESTER

ACHARYA NAGARJUNA UNIVERSITY

UNIVERSITY COLLEGE OF SCIENCES

DEPARTMENT OF FOOD SCIENCE, NUTRITION & DIETETICS

M.Sc. FOOD SCIENCE, NUTRITION & DIETETICS

SEMESTER-I

FSND1.1 (22): NUTRITION THROUGH LIFE CYCLE

Hours of instruction/Week

Theory: 3 hrs.

Practical: 4hrs.

COURSE OBJECTIVES: To enable the students to:

- Learn and understand the Nutritional requirements during different physiological stages of life.
- Know the nutritional problems associated with different physiological stages of life.
- Understand the influences of the nutritional problems on growth and development at different stages of life.
- Know the intervention and management strategies to overcome the nutritional problems.

Unit-1:

- **Food groups:** Classification – food composition and nutritive values of different foods, Functions of foods. Balanced Diet, RDA for all age groups. Food exchange list.
- **Pregnancy***:* Nutrient requirements, intake and gaps, prenatal and postnatal nutritional importance, metabolic adjustments in pregnancy; nutrition intervention and pregnancy outcome; common symptoms (nausea and vomiting, Heartburn- Pica, habits, constipation), nutritional management, problems and complications, adolescent pregnancy.
- **Lactation**: Nutritional requirements, intake, gaps, physiology of milk production, hormonal control, importance of breast feeding, factors affecting breast milk quality and composition and comparative advantages & disadvantages of breast milk, buffaloes and cow's milk.

Unit-2:

- **Infancy**: Nutritional requirements, intake and gaps, Need for formula feedings, types of infant formulae, importance of preparation of weaning foods using locally available foods, Home prepared versus commercial weaning foods. Feeding problems- vomiting, diarrhea, teething problems etc- Lactose and cow's milk protein intolerance, concept of human milk bank.

- **Pre-school children**: Growth and development, nutrient requirements, intake and gaps, Effect of malnutrition on physical and mental development.
- **School-going children:** Nutritional demands, intake and gaps, Importance of breakfast and its impact on school performance, Specific nutritional problems, Macro and Micro nutrient deficiencies and their impact on health and nutritional status and control measures. Government Nutrition Programmes- ICDS and Mid Day Meal Programme (MDMP).

Unit-3:

- **Adolescence**: Nutritional requirements, intake and Gaps, Consequences of Nutritional deficiencies, adolescent pregnancy, Food habits in adolescence, Metabolic consequences of slimming diets & weight maintenance, specific nutritional problems- Anaemia, Anorexia, Bulimia, Amenorrhea and Obesity.
- **Adults:** Nutritional Requirements, Intake and Gaps, Consequences of Nutritional deficiencies, Effect of stress on Nutritional status, Specific nutritional problems of adults.

UNIT-4:

- **Geriatric nutrition**: The process of Ageing, Physiological biochemical and body compositional changes, Theories of ageing. Socio-cultural and psychological aspects of ageing. Food and Nutritional needs of the elderly – Dietary management – Special problem of women – menopausal, post-menopausal problems. Chronic degenerative diseases and nutrition and health problems of the elderly.

UNIT-5:

- **Sports nutrition:** Classification of sports events and RDA for sports person. Nutritional requirements and special needs of sports person, pre, during, post sports events, water and electrolyte balance, ergogenic aids. Endurance and fatigue in sports performance. Assessment-strategies.
- Nutritional needs for Industrial workers, space Nutrition.

REFERENCE BOOKS:

1) Anne loader, 1998. Pregnancy and Parenthood, Oxford, University press.
2) Bhavana Sabarwal, 1999. Public Health & Nutritional care, Common Wealth Publishers.
3) Benjimin I. Borton, 1990. Human Nutrition. New Delhi: Tata Mc. Grow Hill Publishers.
4) Mehtab S. Bamji, 1998. Text Book of Human Nutrition. New Delhi:Oxford and IBFI Publishing Co. (p) Ltd.
5) B.Srilakshi 2006 Dietetics. Bangalore: New Age International Pvt. Ltd. Publishers.
6) Shubhangini A Joshi, 2004 Nutrition and Dietetics, Second edition. New Delhi: Tata Mc Graw-Hill.
7) Gopalan C. Ramasastri B.V. and Balasubramaniam S.C 1999. Nutritive value of Indian
8) Foods. Hyderabad: NIN,

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Interpret and apply health and nutrition concepts to evaluate and improve the nutritional health of communities.	Applying, understanding and evaluating
CO2 Determine nutritional demands, deficiencies at various stages of life.	Understanding, analyzing and evaluating
CO3 Notice nutritional requirements and food requirements during adulthood and old age.	Applying, understanding and interpreting
CO4 Learn about degenerative changes during old age.	Understanding, applying and analyzing
CO5 Provide knowledge on health and nutrition to sports persons, industrial workers, astronauts.	Creating, remembering and applying

CO-PO MAPPING:

Cou	PO1	PO	PO3	PO	PO	PO	PO	PO	PO	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	3			2	2										3	
CO2	3	3			2	3										3	
CO3	3				3	3		1				1					3
CO4	3				2	2		1				1					3
CO5																	

H-High-3, M- Medium-2, L- Low-1

FSND1.2 (22): FOOD CHEMISTRY AND ANALYSIS

COURSE OBJECTIVES: To enable the students to:

- Acquire knowledge on chemical composition of different foods.
- Understand the physical, chemical, and functional properties of foods.
- Know the principles and working applications of different analytical techniques associated with food.
- Perform skills in qualitative and quantitative estimation of nutrients in different foods.

Unit –1:

Water Chemistry and Dispersed Systems

- Water chemistry – Structure of Water, Free, Bound and Entrapped Water.
- Water Activity and Relative Vapour pressure– Definition and measurement, factors affecting water activity, Moisture sorption isotherms, Hysteresis and Moisture Determination.
- Dispersions- Food as dispersed systems, Liquid dispersions.
- Colloids- Definition, Characteristics of Colloids, Gels, Emulsions, Foams.

Unit – 2:

- **Starch Chemistry:** Types of starches, chemical structure of starch, properties of different starches, method of extraction of starch, determination of reducing sugars and non reducing sugars and crude fibre.

Lipid chemistry:

- Lipids – Nomenclature, classification – Milk fats, Animal fats, Vegetable fats.
- Physical properties – Crystallization, Plasticity
- Chemical properties – Thermal decomposition, Chemistry of Frying, Hydrogenation, Inter esterification, Rancidity of fats.
- Fats – Analysis of solid and liquid fats, Rancidity.

Unit – 3:

- **Protein chemistry:** Nature and types of proteins – Plant foods, Egg, Milk and fleshy foods, properties of different proteins.
- Proteins – Electrophoresis, Micro-Kjel dahl method.

Unit – 4:

- **Fruits and vegetables**: Post harvesting changes- Chemistry- composition of fruits and vegetables. Plant tissues and relationship with texture.
- **Plant pigments** – water insoluble plastid pigments- Chlorophyll and carotenoids – Chemical structure. Water soluble pigments- anthocyanins, anthoxanthins, flavones and tannins.
- **Food enzymes** – types of enzymes in foods and their importance to food quality.

- Methods of determination of total ash
- Vitamins and Minerals - Ca, Phosphorus, iron, Vitamin A, Beta carotene, Riboflavin and Vitamin C

Unit-5:

- **Instrumentation:** Basic principles and applications of spectroscopy- UV, UV- visible, AAS, AES, Electromagnetic Resonance.
- Chromatography- principles and applications of Chromatography- HPLC, GC/ MS and LC/ MS.

REFERENCE BOOKS:

1) Berk.Z., Introduction to bio-chemistry of foods, dept. of food Engineering and biotechnology, Israel Institute of technology, Amsterdam, New York.
2) Clipton. E.Meloan, food analysis 3rd edition (Theory &Practice).
3) David and Robinson, Bio-chemistry and Nutritional value.
4) Dennis .D, Muller., Food chemistry, a Laboratory Manual by inter science publication, John Willey&Sons Inc.
5) W.S.wong, mechanism and theory of food chemistry, CBS publishers and distributors 1996.
6) Seemayadav, Food chemistry, Publication of anmol pvt., ltd., 1997.
7) Owen R. Food chemistry 2nd edition.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Develop an understanding of different forms of water and water activity	Creating and understanding
CO2 Acquire knowledge on chemical nature and analytical techniques of starch and lipids.	Understanding, applying and analyzing
CO3 Analysis and identification of protein molecules in plant and animal food stuffs. **CO4** Identification of post harvesting changes in fruits and vegetables. Analytical techniques of micronutrients in fruits and vegetables.	Analyzing and interpreting
CO5 Provide awareness about the principles, methods and applications of spectroscopy and Chromatography techniques.	Applying, evaluating and analyzing
CO1 Develop an understanding of different forms of water and water activity	Understanding and analyzing

CO-PO MAPPING:

Cour	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	**1**					**2**	**2**									**2**	
CO2	**3**				**3**	**2**	**2**									**1**	
CO3						**3**	**3**				**2**					1	
CO4	**2**		**2**		**1**	**1**										1	
CO5	**2**		**2**		**1**	**1**										1	

H-High-3, M- Medium-2, L- Low-1

FSND1.3 (22): CLINICAL NUTRITION AND DIETETICS

Hours of instruction/Week-

Theory: 5 hrs.

Practical: 3hrs.

COURSE OBJECTIVES: To enable the students to:

- Understand the role of dietitian.
- Gain knowledge about the principles of Diet therapy and different therapeutic diets.
- Develop aptitude for taking up dietitian as a profession.

Unit I

- Introduction to clinical Nutrition and Dietetics: Definition and history of dietetics, optimum nutrition and health- interrelationship between food, nutrition and health, Basic principles of planning healthy diet,
- Regulation of food intake - hunger, satiety - Role of neurotransmitters.

Unit II

- Diet counseling: Theories of diet counseling
- Counseling strategies
- Nutrition care process
- Specific functions of a therapeutic, administrative and consultant dietitians, team approach in patient care.
- Physiologic/Metabolic Stress: Phases of stress, Consequences, Dietary management in stress, stress relieving foods.

Unit III:

- Therapeutic Diets: Definitions: Normal diets, Therapeutic modifications of the normal diets. Principles in planning therapeutic diets.
- Progressive diets: Routine/Regular hospital diets, Liquid diets, Soft diets Special feeding methods: Enteral and Parenteral Nutrition, Types, methods and formulation of feedings.
- Planning of special diets for
  a. Surgical conditions
  b. Transplant patients.
  c. Burns

Unit IV:

- General principles of diet for the conditions-
  a. Musculoskeletal and Rheumatic Disorders-Osteoporosis, Osteoarthritis, Rheumatoid Arthritis, Gout.
  b. Cancer - Effect of cancer therapy on nutrition of the patient.
  c. AIDS.
- Neurological Disorders –Migraine syndrome, Alzheimer's disease, Parkinson's disease.

UNIT V:

- Food and Drug Interactions: Risk factors for food and drug interactions.
- Effect of food on drug therapy.
- Effect of drug on food and nutrition.
- Modifications of drug action by food and nutrition.
- Effect of drug on nutritional status.

TEXT BOOKS:

1) B. Srilakshmi. (2010). Dietetics, 4th edi. 1969, 3rd edi. New Age International (P) Ltd., Publishers Bangalore, Chennai, Hyderabad.
2) Anderson. L. et. al. (1982). Nutrition in Health and Disease. 17th edi. J.B. Lippin Cott Company, Philadelphia, Toronto
3) Whitney NE, Cataldo BC, Rolses RS. (1987).Understanding Normal and Clinical Nutrition" West Pub.Company. St Paul, New Yok, Los Angeles, San Fransisco.
4) June R. Payne-Palacio and Deborah D. canter. (2011). The Profession of Dietetics. Jones and Bartlett Learning Publishers. USA.
5) Kathy k. and Bridget Klawitter. (2003). Nutrition Therapy- Advanced Counseling. Lippincott Williams and Wilkins Publishers.
6) Alexander G. Kazaks.(2013). Nutrition and Obesity. Jones and Bartlett Learning Publishers. USA.
7) Mahtabs. Bamji and N.Pralhad Rao. (2004).Text book of Human Nutrition, Second Edition, Oxford and IBH Publishing co. Pvt Ltd. New Delhi.
8) Heather Hedrick Fink, Alan E. mike sky. (2012). Practical Applications in Sports Nutrition, Third Edition, Library of Congress Cataloging in Publication Data. United States of America.
9) N.Menta Nitin. Jmenta. (2014). Nutrition and Diet for Children Simplified Meenakshi Jaypee Brothers Medical Publishers (P) LTD.
10) Davidl. Katzwolters Kluwer/Lippin Cott Williams and Wilkins. (2007). Nutrition in Clinical Practice Second Edition.
11) C.Gopalan, B.V.Ramasastri and S.C. Bala Subramanian. (2012). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council Medical Research Hyderabad.
12) Nutrient Requirements and Recommended Dietary Allowance for Indians A Report of the Expert Group of ICMR. 2010.
13) Dr. M Swami Nathan. (2010). Food and Nutrition Volume-2 Second Edition the Bangalore Printing and Publishing Co Ltd Bangalore 560018.
14) Shubhangini A.Joshi. (2010). Nutrition and Dietetics Third Edition Tata Mecgraw Hill Education Private Limited New Delhi.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Integrate nutrition principles in to the treatment and prevention of diseases.	Applying, Creating and understanding
CO2 Implement diagnostic and treatment measures through the nutrition care Process.	Applying, analyzing and evaluating
CO3 Generate knowledge on therapeutic diets.	Remembering, understanding and applying
CO4 Assess principles and importance of therapeutic diets for various diseases and drug interactions	Creating, analyzing and evaluating
CO5 Generate knowledge on food and drug interaction	Creating, Understanding and analyzing

CO-PO MAPPING:

Cours	PO	PO	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P 10	P 11	P 12	P 13	P 14	P 15	PSO 1	PSO 2
CO1			3			2		1							3		3
CO2						2					1				3		3
CO3	1		3	3	2												2
CO4		3	3	2		2											1
CO5			2						1					3	3		1

FSND1.4 A (22): FOOD SCIENCE AND EXPERIMENTAL FOODS

COURSE OBJECTIVES: To enable the students to:

- Acquire knowledge on Plant and Animal foods composition, processing and preservation of nutritive values.
- Understand the principles of cookery of different foods and methods of evaluation.
- Apply knowledge about different processing techniques on nutritive quality of foods.
- Apply skills in standardization of foods using different processing techniques

UNIT-I: Introduction to Food Science

- Food groups, food in relation to health.
- General Methods of cooking- dry and moist heat methods, microwave and solar cooking, advantages and disadvantages, Nutrient losses during cooking.

UNIT II: Foods of Plant Origin

- Cereals and Millets: Starch - Structure, Characteristics of some food starches. Gelatinization, Factors effecting gelatinization. Modified food starches-Applications.
- Pectin and Gums: Functional roles in food products.
- Baking process: Cereal flours, Flour mixes -dough and batter, Leavening agents-Applications
- Pulses and Legumes: Composition, Toxic constituents, Processing, Effect of cooking.
- Vegetables and Fruits: Classification, Composition, Pigments and Flavors constituents - Cooking effect, Browning reaction.

UNIT III: Foods of Animal Origin

- Milk: Composition, Kinds of milk and Functional properties of Milk.
- Egg: Structure, grading, quality and Functional properties of eggs.
- Meat and Poultry: Structure, Muscle composition, Postmortem changes, Heat-induced changes in meat, Tenderness – Tenderizers.
- Fish and Marine foods: Classification and Composition, Selection and cooking.

UNIT IV: Sugars and Fats

- Sugars, sugar crystals and Confections: Types of sugars and sugar syrups, Sugar cookery, Crystallization of sugars, Confectionery-Types, raw materials and their role, Indian confectionery.
- Fats and oils: Sources, Composition, Absorption, Functional properties of fat, Rancidity.

UNIT V: Sensory Evaluation

- Sensory Attributes of food quality and its characteristics.
- Requirements to conduct sensory evaluation- Sensory panel, Preparing and Presenting Samples for Testing, Panel booth.
- Sensory Tests – Analytical and Affective Tests.

REFERENCE BOOKS:-

1) Belle Lowe. (1998).*Experimental Cookery*, John Wiely & Sons, INC, New York.
2) Griswold. R.M. (1962).*The Experimental Study of Foods*. Houghton and Mifflin company, Boston, New York.
3) Marjorie P. Penfield & Adamarie Campbell.(1990). *Experimental Food Science*, Third Edition, Academic Press, New York.
4) N.Shakuntula Manay& M. Shadaksharswamy. (2001).*Foods- Facts and Principles*, second edition, New Age International Publishers, New Delhi.
5) Norman N Potter.(2007).*Food Science*, Fifth edition, An Aspen Publication, Mariland.
6) Paul,E. and Palmer A.H.(2002). *Food Theory and Application*, John Wiley & Sons, New York.
7) Sethi Mohini.(2011).*Food Science: Experiments and Application*, second edition, Jain book Agency, New Delhi.
8) Srilakshmi,B.(2001).*Food Science*, 2nd edition New Age International (P) Ltd., Publishers, Bangalore, Chennai & Hyderabad.
9) Subbulakshmi & Shobha A. Udipi.(2001).*Food processing and preservation*. New Age International (P) Ltd., Publishers Bangalore, Chennai.
10) Swaminathan, M.(1979).*Food science and Experimental foods*. Ganesh & Co., Madras.
11) Vijayakhader.(2001).*Text book of food science and Technology*, ICAR, New Delhi.
12) Sumathi,R. Mudam by and ShaliniM.Rao.(2003). *Food science*, New age international Pvt. ltd., publishers, New Delhi.
13) Edwards, W.P. (2007). The science of bakery products, RSC publishing, Cambridge.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Learn about changes occur in food and nutrients during cooking.	Understanding, remembering and Applying
CO2 Understand the structure, characteristics and processing of cereals and millets.	Understanding, remembering and analyzing
CO3 Learn about nutrient composition of milk, egg, meat and fish.	Remembering, understanding and applying
CO4 Knowledge on sugar cookery and confectionary.	understanding, remembering and evaluating
CO5 Acquire skills in sensory evaluation techniques.	Analyzing and evaluating

CO-PO MAPPING:

Cou	PO	PO	PO	PO	PO	PO	PO	PO	PO	P 10	P 11	PO 12	P 13	P 14	P 15	PS 1	PS 2
CO1	2		1		1	3	3									2	3
CO2			3		1	3		2			2			1		2	1
CO3	2				1	2								3	3	2	1
CO4	2			3	1	1								1		2	1
CO5			3		1	1								1		1	

ELECTIVE FOUNDATION PAPER

FSND1.4 B (22): FUNDAMENTALS OF NUTRACEUTICALS

COURSE OBJECTIVES: To enable the students to:

- Create awareness about various Nutraceuticals.
- Understand the chemical nature and mechanical action of Nutraceuticals.
- Equip knowledge about applications of Nutraceuticals in various diseases and disorders.
- Provide information about Nutraceutical industry

Unit-I

Introduction to Nutraceutical Industry:

Organizational elements, classification of nutraceuticals, dietary supplements, fortified foods, functional foods and phytonutracuticals. Scope involved in the industry, Indian and global scenario.

UNIT- II

Categorization of Nutraceuticals - Classification - Based on food source, mechanism of action and chemical nature-isoprenoid, phenolc substances, fatty acids and structural lipids, carbohydrates and amino acid based derivatives, isoflavones.

UNIT- III

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

Unit-IV

Nutraceuticals of plant and animal origin: Plant secondary metabolites, classification and sub-classification -Alkaloids, phenols, Terpenoids. Extraction and purification, applications with specific examples with reference to skin, hair, eye, bone, muscle, heart, brain, liver, kidney, general health and stimulants. Concept of cosmoceuticals and aquaceuticals. Animal metabolites-Sources and extraction of nutraceuticals of animal origin. Examples: chitin, chitosan, glucosamine, chondroitin sulphate and other polysaccharides of animal origin, uses and applications in preventive medicine and treatment.

Unit-V

Nutraceutcals in Health and Disease - Sources and role of Functional foods and Nutraceuticals- Sources of functional foods and Nutraceuticals, concept of dietary supplements, phytochemicals, phytosterols, omega 3 and 6 fatty acids, dietary fiber, role of nutraceuticals in health and disease management, non essential nutrients as dietary supplements, FOSHU foods.

PRACTICALS:

1) Extraction of plant secondary metabolites by different methods.
2) Chemical profiling of plant samples and extracts.
3) Optimization of extraction methods for herbal extract with active principles.
4) Extraction of alkaloids, polyphenols and related compounds
5) Extraction of flavonoids and flavones.
6) Extraction of terpenes and terpenoids.
7) Extraction of saponins.
8) Lab scale cultivation of algae of nutraceutical importance.
9) Lab scale production of probiotics.
10) Extraction of prebiotics from suitable plant sources.

REFERENCE BOOKS:

1) Handbook of nutraceuticals and functional foods by Robert E C. Wildman, CRC/Taylor&Francis.
2) Handbook of nutraceuticals Vol I by YahwantVishnupant Pathak, CRC press.2009.
3) Handbook of nutraceuticals Vol II by YahwantVishnupant Pathak, CRC press,2011
4) Handbook of Prebiotics, GlennR.Gibson, MarcelRoberfroid, CRCpress, 2008.
5) Swaminathan M., Essentials of Food and Nutrition, 2ndEd, 1985, Ganesh and Co.
6) Understanding Nutrition, 8"'Edition, by Whitney, E.N. &Rolfes, S.R. (1999): WesV Wadsworth, An International Thomson Publishing Co.
7) Nutrition in Health and Disease 17thEdition; Anderson, Dibble, Turkki, Mitchell, Rynbergen J.B. Lippincott Company, 1982
8) Nutritional Quality Index of Foods; R.G. Hansen, B.W. Wyse, A.W. Sorenson AVI Publishing Co., Inc., 1979.
9) Dietary Supplements of Plant Origin, M. Maffei (Ed.), Taylor & Francis, 2003.
10) Bioprocesses and Biotechnology for Functional Foods and Nutraceuticals, Jean – Richard Neeser& J. BruceGerman, Marcel Dekker, Inc., 2004.
11) Herbal Products –Timotht S. Tracy, Richard L. Kingston.
12) Herbal beauty products with formulation & processes-H. Panda.
13) Medicinal Plants (Traditional Knowledge)-P C Trivedi.
14) Nutritional Biochemistry, II edition by Tom Brody
15) Nutraceuticals in health and disease prevention, Klaus Krämer, Peter-Paul Hoppe, Lester Packer.
16) Zubay, Geoffrey L., Biochemistry, 4thEd, Dudagye, IAWCB Wm. C. Brown Publishers, 1988, London.
17) Nutraceutical beverages Chemistry, Nutrition and health Effects, Shahidi and Weerasinghe (Ed.), American Chemical Society, 2004.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Learn about organizational elements in nutraceutical industry	Understanding, remembering and evaluating
CO2 Students learn about- mechanism of action of nutraceuticals and chemical nature of nutraceuticals	Understanding, applying and analyzing
CO3 Understanding about nutraceuticals of microbial origin and role of pre and Probiotics in health and disease.	Remembering, analyzing and creating
CO4 Knowledge about nutraceuticals of plant and animal origin	Understanding and remembering
CO5 Learn about nutraceuticals as dietary supplements and sources	Understanding, remembering and applying

CO-PO MAPPING:

Cours	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1						2	2						3	2			2
CO2	2		1	2		1											1
CO3			3	2	1	2							3	2		1	2
CO4	3		2	2	1											2	
CO5	3		2	2	1											2	1

ELECTIVE FOUNDATION PAPER

FSND1.4 c (22): COMMUNITY NUTRITION

COURSE OBJECTIVES: To enable the students to:

- Know about nutrients in food and their functions.
- Understand the consequences of deficiency of taking nutrients.
- Apply skills for planning diets for nutritional disorders.
- Apply the techniques to assess the nutritional status of different age groups.

UNIT-I: Food Composition - Grouping

- Food Groups – Classification – food composition
- Nutritive values of different foods, Functions of foods and nutrients – cereal grains, millets, pulses, nuts and oil seeds fruits and vegetables, milk and milk products, meat, egg, poultry and fish, spices and condiments.
- Menu planning– Definition, Principles, Factors affecting menu planning

UNIT-II: Assessment of Nutritional Status of the Community

- Need - Methods of Assessment - (a) Direct Methods - (i) Diet Surveys (ii) Anthropometric Assessment - (iii).clinical and (iv). Biochemical Assessment.
- (b) Indirect Methods - Vital Statistics - Merits and Demerits of methods -
- Nutrition surveys - longitudinal and cross sectional - Family, individual and institutional surveys - Techniques for assessment of age - use of reference standards for the assessment of nutritional status.

UNIT- III: Major Nutrition Problems of the Community

- Malnutrition and under nutrition- PEM/CED, obesity- deficiencies of vit-A, iron /iodine - Etiology –Symptoms - Government programmes to eradicate PEM, vitamin-A, Iron and Iodine deficiencies – Principles of planning diets for different conditions of malnutrition .

UNIT-IV:

- Food and nutritional security – Definition – problems - Management of food and nutritional insecurity - Food Fortification and enrichment.

UNIT-V: Strategies to Combat Malnutrition

- Food Assistance and Food Supplementation - Policies and Programmes of the Government - Governmental Policies and Programmes - Food Assistance and Food Supplementation Programmes - Public Distribution System (PDS) - Food For Work (FFW), Special Nutrition Programme (SNP), School Lunch Programme (SLP), Mid Day Meal Programme (MMP), Balawadi Nutrition Programme (BNP), Integrated Child Development Services (ICDS).
- Nutrition Education - Importance - Approaches Media and Methods.

PRACTICALS:

1) Assessment of Nutritional Status using Anthropometry,
2) Assessment of Nutritional Status using Dietary method
3) Planning of Diets for Different Nutritional Deficiencies like PEM, Anemia, Vit-A.
4) Planning and Preparation of Programmes for Significant Days like Breast Feeding Week Nutrition Week, World Food Day.
5) Study of the following through visits
   - Govt School Lunch Programme
   - ICDS Programme
   - Anganwadi Training Centers.
6) School Lunch Programme at Sri Venkateswara University Laboratory Nursery School.
7) Community Nutrition Programme Planning - Introduction, Identification of problem, nutritional assessment, analysis of causes, resources, constraints, selection of interventions, setting a strategy, implementations, evaluation of the programme

REFERENCE BOOKS:

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

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Information about food groups and nutritive values of different foods and principles of planning menus	Understanding, remembering and applying
CO2 Knowledge about methods of nutritional status assessment and nutrition surveys	Understanding, applying and analyzing
CO3 Awareness about nutritional problems of the community.	Remembering, understanding and evaluating
CO4 Knowledge about food and nutritional security.	Understanding, remembering and applying
CO5 Government programmes to combat malnutrition	Understanding and applying

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	2	2		1												2
CO2		3	2	1	1												2
CO3		3	3		2	2		2									1
CO4	1		1		1	2											1
CO5		1						3	3					3	3		1

PRACTICAL-I:

FSND 1.5 (22): NUTRITIONAL THROUGH LIFE CYCLE & CLINICAL NUTRITION AND DIETETICS

I.

1) Food Exchange list
2) Standardization of Dietary Assessment Vessels/cups
3) Planning and preparation of suitable diets for pregnant women.
4) Planning and preparation of suitable diets for lactating women.
5) Planning and preparation of suitable diets for infants.
6) Planning and preparation of suitable diets for pre-schools.
7) Planning and preparation of suitable diets for school going children.
8) Planning and Preparation of suitable diets to adolescents.
9) Planning and Preparation of diets to adults and elderly.
10) Planning and preparation of diets for sports persons, Astronauts and industrial workers.

II

1) Visit the local hospitals to study food preparation and service to patients.
2) Planning and preparation of Progressive Diets
    a. Clear Diet ,
    b. Full Fluid Diet,
    c. Soft Diet,
    d. Regular Diet,
3) Therapeutic Adaptations of Normal Diet
    a. High and Low calorie diet,
    b. High and Low Protein Diet,
    c. Low fat and Low Cholesterol Diet,
    d. High and Low Fibre Diet,
    e. Sodium Restricted Diet,
    f. Low Carbohydrate Diet,
    g. Acid ash and alkaline ash diet.
4) Visits to hospitals to collect case reports.
5) Planning and preparation of different Special Feeds.

PRACTICAL-II:

FSND 1.6 (22): FOOD CHEMISTRY AND ANALYSIS & FOOD SCIENCE AND EXPERIMENTAL FOODS

I

1) Determination of moisture content in different foods.
2) Estimation of protein by Kjeldahl method.
3) Fats and oils – Determination of
   - Iodine number
   - Free fatty acid number
   - Saponification number
   - Peroxide value of fresh and heated oils
   - Determination of fat in milk.
4) Carbohydrates- determination of starch
   - Diastatic value of wheat flour
   - Reducing sugars- Sucrose in Honey
5) Determination of total mineral content of foods
6) Estimation of vitamin C
7) Calcium
8) Qualitative analysis of enzymes in plant foods
9) Qualitative analysis of enzymes in animal foods

II

1) Standardization of weights and measures of various foods
2) Starch cookery - Structure, gelatinization and factors affecting gelatinization
3) Baking – Determination of gluten content, Preparation of plain cake, Bread and evaluation by subjective and objective methods.
4) Pulse cookery – effect of different processing methods-Soaking, germination, malting-effect of factors.
5) Vegetable cookery – Effect of time, temperature, media and cooking methods on pigments.
6) Fruit - Enzymatic Browning- Preventive measures.
7) Sugars and confections - Factors affecting crystallization in candies like fondant, experiments on applying scientific methods to Indian confectionary, preparation of confections – role of ingredients and processing of confectionary.
8) Fats and oils – Smoke points, oil absorption and stability of emulsion – mayonnaise.
9) Milk cookery - preparation of milk products-Effect of cooking.
10) Egg cookery - Egg white foams: preparation of the eggs acting as binding, emulsifying and thinking agent.
11) Meat and Fish cookery - Effect of different cooking methods and tenderizers.
12) Sensory Evaluation of food.

SECOND SEMESTER

M.Sc. FOOD SCIENCE, NUTRITION & DIETETICS

SEMESTER-II

FSND 2.1(22): NUTRITIONAL BIOCHEMISTRY

Hours of instruction/Week
Theory: 5 hrs.
Practical: 3hrs.

COURSE OBJECTIVES: To enable the students to:

- Understand the metabolism of Nutrients
- Examine the interrelationship between metabolism of macro nutrients in normal health deficiency and diseased conditions.
- Study the role of enzymes and hormones in the metabolism of macro and micro nutrients in normal, deficiency states and diseased conditions.

Unit-I

- Carbohydrate Metabolism: Carbohydrates, Oxidation of glucose by Glycolysis, TCA cycle, Electron Transport Chain (ETC), Oxidative Phosphorylation, HMP path way, Glycogenesis, Glycogenolysis and Gluconeogenesis. Glycogen storage in normal and diseased states.
- Endocrinal influences on carbohydrate metabolism, Regulation of blood glucose concentration, the renal threshold for glucose disturbance in carbohydrate metabolism. Diabetes Mellitus, Diabetic ketoacidosis, inborn errors of carbohydrate metabolism.

Unit- II

- Proteins and Amino Acids: Sources, structure, functions, digestion and absorption of proteins.
- Classification of amino acids – peptides and proteins. Metabolism of amino acids - Amino Acid decarboxylation, Tran's peptidation.
- Formation and Disposal of Ammonia - Hepatic coma, creatine and Creatinine - biosynthesis.
- Nucleic acid - DNA, RNA, Bases - Purines and Pyrimidines, Synthesis of Nucleic Acids - Steps of replication - Initiation, Elongation and Termination. Protein biosynthesis.
- Enzymes – Classification, functions of enzymes; factors affecting enzyme activity.
- Hormones - Classification and functions of hormones.

Unit- III

- Fatty Acid Metabolism: Oxidation and bio synthesis of fatty acids, Ketone bodies and Ketosis, Bio synthesis of cholesterol and their regulation, Metabolism of bile pigments.
- Lipids of biological significance - Lipoproteins and prostaglandins in health and disease.
- Metabolic Interrelationships between Carbohydrate, Lipid and Proteins.

UNIT - IV

- **Vitamins:** sources, functions (also their role as cofactors in metabolism) deficiency states, factors influencing bioavailability and requirements.

UNIT – V

- **Minerals:** sources, functions (also their role as cofactors in metabolism) deficiency states, factors influencing bioavailability and requirements of Calcium, Phosphorus, Iron, Iodine, Zinc, Sodium, Potassium, Chloride and Flourine. Metabolism of Calcium and Phosphorus.

REFERENCE BOOKS:

1) Victor L. Davidson and Donald B. Sihman. (1994). Biochemistry, The National Medical Series for Independent Study. Harward Publishing.
2) Keith Wilson and John Walker. (2000). Practical Biochemistry Principles and Techniques". 5th Edition.Cambridge University Press.
3) Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2000). *Lehninger principles of biochemistry*. New York: Worth Publishers.
4) Sathyanarayana.U, 2001. Biochemistry. Calcutta: Books & Al lied (P) Ltd, 8/ I - Chintharnani Das Lane.
5) Talwar G.P. (1989). Text book of Biochemistry and Human Biology" 2nd Edn. National Book Trust in India.
6) Nath R.L. (1996). Text book of Medicinal Biochemistry. New age International (P) Limited, Publishers, New Delhi.
7) J.J. Rodale and Staff. (1976). "The complete book of nutrients for health," Rodale books.INC,
8) Witney E.N., Cataldo, C.B., Sharn, R.R. (1986). Understanding Normal and Clinical Nutrition West Publishing Company, St. Paul, NY.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Knowledge on metabolic pathways and disorders of metabolic pathways.	Understanding, remembering and applying
CO2 Information on functions of proteins, amino acids, enzymes and harmones.	Understanding and remembering
CO3 Understand fatty acid metabolism and interrelationships between carbohydrates, proteins and fats	Remembering, analyzing and creating
CO4 Knowledge on functions, deficiencies and bioavailability of vitamins.	Understanding, remembering and applying
CO5 acquired information on functions, deficiencies and bioavailability of minerals	Understanding, remembering and applying

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	**3**				**1**	**2**	**2**						3				**1**
CO2				**2**	**1**	**2**	**2**						3				**1**
CO3	**3**				**1**	**2**	**2**						3				**1**
CO4		**3**			**1**			**3**									**1**
CO5		**3**			**1**			**3**									**1**

MANDATORY CORE PAPER

FSND 2.2(22): FOOD PROCESSING AND PACKAGING TECHNOLOGY

COURSE OBJECTIVES: To enable the students to:

- Knowledge of basic and applied aspects of food processing and technology.
- Knowledge of principles and methods of preservation.
- Knowledge of potential use of various by-products of food industry.

UNIT I:

- Food Processing and Preservation – Introduction, Need, Purpose and scope, Principles and Methods of food processing and preservation.
- Traditional Methods of food processing and preservation.
- Preservatives and Additives - Classification, applications, permissible limits and safety aspects.

UNIT II:

- Methods of Food Processing and Preservation: Processing and preservation by Heat - Principles of thermal processing, blanching, pasteurization, UHT processing, thermal sterilization, canning, extrusion.
- Processing and preservation by Cold- Refrigeration and freezing, methods of freezing, effect on quality of foods.
- Processing and preservation by Dehydration and Concentration – Types, Methods and their suitability for different food products.

UNIT III:

- Processing and Preservation by Fermentation: Definition, types, Importance, Technology, Benefits and Limitations.
- Processing and preservation of fermented foods - Cereal and pulse products, Vegetables, Milk products, Beverages, meat products.

UNIT IV:

- Processing and Preservation by Novel Methods: Irradiation, High Pressure, Ultrasonic, High Intensity Light, Pulse Electric Field, Ohmic Heating, Pulsed X-rays, Microwave, Radio Frequency, Minimal Processing, Edible Coatings and Films, Membrane Processing, Hurdle Technology, Nanotechnology and Application in foods.
- New Food Products: New food product: Definition, Characteristics and Need for New food product development. Classification: Line extensions - Repositioning of existing products - New form of existing product - Reformulation - New packaging - Innovative products - Creative products and Value added products.

UNIT V:

- Packaging Materials **:** Definition, importance and scope of packaging of foods Origin of packaging materials, types, properties, advantages & disadvantages of packaging materials
- Types of packaging material and their testing**:** Forms of packaging – box, bottle, tetra, pouch, shrink, vacuum, gas, CAP, MAP, asceptic etc. WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test etc.

REFERENCE BOOKS & TEXT BOOKS:

1) Anuradha Subramanian.(1998). *Concise Food Science*, Soundariya Publication, Erode.
2) Fellows,P. and Ellis,H. (1990). *Food Processing Technology: Principles and Practice*, New York.
3) Harry. W. Von Loesecke.(1998). *Drying and dehydration of Foods*, Allied Scientific,NewDelhi.
4) Jelen,P. (1985). *Introduction to Food Processing*, Prentice Hall, Reston Virginia, USA.
5) Lewis, M.J. (1990). *Physical Properties of Food and Food Processing Systems*, Wood head, UK.
6) Norman, N. Potter, Joseph H. Hotchkiss.(1996). *Food Science*, 5th edition, CBS Publishers &Distributors, New Delhi.
7) Rama swamy, H. and Marcote, M. (2005).*Food processing- principals and applications*, Tamil Nadu.
8) Vijayakhader. (2000). *Text book on food storage and preservation*, Kalyani Publishers,
9) NIIR Board. *Modern technology on food preservation*, Asia pacific business press, New Delhi.
10) NIIR Board of consultant and engineers.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Learn about principles of processing and preservation	Understanding, remembering and applying
CO2 Generate new knowledge about the thermal, cold and dehydration methods of processing and preservation.	Understanding , remembering and analyzing
CO3 Understand the processing and preservation by fermentation techniques	Remembering, analyzing and creating
CO4 Knowledge about processing and preservation by novel methods and development of new product	Creating, applying and evaluating
CO5 Importance and types of packaging materials	Understanding, remembering and applying

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1			**2**		**1**	**3**								1			**1**
CO2	**2**		**1**			**3**											**1**
CO3						**3**								**1**			**1**
CO4			**1**			**3**											**1**
CO5	2				2	3								**1**			1

COMPULSORY FOUNDATION

FSND 2.3 (22): ENTERPRENEURSHIP DEVELOPMENT

Hours of instruction/Week
Theory: 3 hrs.
Practical: 4hrs

COURSE OBJECTIVES: To enable the students to:

- The objective of the Entrepreneurship in graduates and advanced level of entrepreneurial vision and entrepreneur will.
- The ability to identify opportunities that exist, that represent untapped markets and underserved markets, and those that can be created by applying existing technologies to new fields and new markets.

UNIT I:

- Concept of Entrepreneurship and enterprising.
- Growth of Entrepreneurs and Entrepreneurship, factors determining the growth of entrepreneurship.
- Role of Entrepreneurship in economic development.
- Entrepreneurial culture and spirit: Assessment of Entrepreneurship qualities and personalities, Entrepreneurship skills, creation of different visions-Emerging-Central and secondary visions.
- Entrepreneurial motivation: The motivating factors, Entrepreneurial ambitions, compelling factors, facilitating factors and achievement motivation.

UNIT II:

- Process of entrepreneurship development: Stage wise tasks to be performed. The learning required to perform the tasks.
- Women Entrepreneur: Concept of women entrepreneurs, contribution of female entrepreneurs to the economy, psycho, socio-economic and demographic profiles of women entrepreneurs in India.
- Problems of women entrepreneurs and role of women entrepreneurs association.

UNIT III:

- Entrepreneurial development programs in India: Concept of entrepreneurial development.
- Need for training and development, phases of entrepreneurial development program, contents of training for entrepreneurial development.
- Target groups, special agencies and schemes.
- Institutions conducting entrepreneurial development program and evaluating entrepreneurial development programs.

UNIT IV:

- Development of the business plan: Idea generation and validating the idea.
- Statement of objectives and description of product/service, clients and scope- Market research and analysis, location choices, operations plan, analysis of risks, organization of the management team and distribution of tasks.
- Overall schedule of activities leading to start up and the finance management.

UNIT V:

- Negotiations with the family friends, relatives, shareholders and financial institutions- Angel' money.
- Entrepreneurship support systems: Institution set up DISCS and Industrial estates, SIDCO, SIDO, NSIC, SISI, SIPCOT, IIC, NAYE, NSIET, NPC, KVIC, TCUC, CTCOT, Commercial banks SHG (Self help groups).
- Developing leadership among women entrepreneurs and Networking amongst entrepreneurs.

REFERENCE BOOKS:

1) Harish, Economic development and role of Indian women, common wealth publishers, New Delhi-110 002.
2) Jain P.C. Hand book for new Entrepreneurs Oxford Universisty press.
3) Medha Dubhashi, women Entrepreneurs in India, common wealth publishers, New Delhi-112 002
4) Rush, H.A. Economic development & Role of Indian women, common wealth publisher,New Delhi-112 002.
5) Uddin Entrepreneurship development in India, Sami, University press.
6) Indian journal of Nutrition and Dietetics.
7) NIN Journals
8) Current Science
9) Journal of Medical microbiology
10) American journal of clinical nutrition.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 The ability to identify opportunities that exist and motivate the entrepreneurship	Understanding, applying and creating
CO2 Understand the process of entrepreneurship development	Understanding and remembering
CO3 Learn about concept of entrepreneurial development	Understanding, Remembering and creating
CO4 Acquire knowledge on development of the business plan	Understanding, applying and evaluating
CO5 Understand about entrepreneurship support systems	Understanding, analyzing and creating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1					**1**				**2**		**2**	**3**					**1**
CO2	**1**				**1**				**2**		**2**	**3**					**1**
CO3	**1**				**1**				**2**		**2**	**3**					**1**
CO4					**1**				**2**			**3**				1	**1**
CO5					1				**2**			3				1	1

ELECTIVE FOUNDATION PAPER

FSND2.4 A (22): FOOD REGULATION AND QUALITY CONTROL

COURSE OBJECTIVES: To enable the students to:

- Standardize food products through sensory evaluation.
- Understand the fundamental food quality control procedures.
- Know about Food standards and Laws.

UNIT I

Concept of quality:

Quality attributes-physical, chemical, nutritional, microbial, and sensory-their measurement and evaluation. Sensory and instrumental methods for testing quality. Objectives, importance and functions of quality control. Methods of quality, assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products.

UNIT II

Concepts of quality management:

Objectives, importance and functions of quality control. Quality management systems in India. Sampling procedures and plans. Domestic regulations. Global Food safety Initiative.

UNIT III

Common adulterants, tests to detect adulterants contaminants, naturally occurring toxins in food metallic pesticide and preservative contaminants. Non nutritive food components and their potential health effects, phoyphenols, tannins, phyto oestrogens, cyanogenic compounds, lecithin, saponins.

UNIT IV

Food laws and regulations:

Government and trade standards for quality – food laws and regulations – PFA, FPO and Food Safety Act 2006, 2011. BIS standards, Agmark standards, Compulsory National legislation Act, Essential Commodities Act, Consumer protection Act. International Standards for export, Codex Alimentarius, USFDA, WTO, ISO 2200, WHO and FAO, FSSAI, APEDA and MPEDA.

UNIT V

Quality Assurance:

Rules and regulations for setting up of a processing unit. Criteria for ingredients and finished products. Aspects of microbiological safety in food preservation technologies, Establishment and implementation of HACCP, Continuous Assessment System, Total quality management and quality audits in food industries.

REFERENCE BOOKS:

1) BIS Standards
2) Giridarillal Sidappa G.S., and Tandon, G.L. (1979) Preservation of fruits and vegetables, ICAR, New Delhi.
3) FPO (1955) Quality control.
4) Horace D.Graham. 1980 The safety of foods, 2nd End. AVI Publishing Co. Inc. Westport.
5) Julie Miller Jones. 1992 Food Safety, Enagan Press, USA.
6) Lewis M.J. 1987 Physical Properties of Food and processing system. Ellis Horwood Ltd., England.
7) Picgott, J.R.1984. Sensory analysis of Foods Elsevier. Applied Science Publisher, New York.
8) Principles and practices for the safe processing foods, David Ashapton.
9) Early. R. (1995): Guide to Quality Management Systems for the Food Industry.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Students will have a thorough understanding on the quality attributes, their measurement principle and instrumentation of various instruments used in food quality analysis.	Understanding, applying and analyzing
CO2 Awareness about quality control and management	Understanding , remembering and applying
CO3 The students will know the importance of various methods to identify any adulteration aspect of food.	Understanding, applying and creating
CO4 Students will have a thorough understanding on various food laws with their amendments and regulation guidelines followed in national and international level.	Understanding, analyzing and evaluating
CO5 Knowledge about microbiological safety	Understanding, applying and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	1			1	1	2	3						1				1
CO2	2					1	3						1				1
CO3	1		3										1				1
CO4	1				3		3		3				1				1
CO5	1		3		1		3						1				1

ELECTIVE FOUNDATION PAPER

FSND2.4 B (22): NUTRITION IN EMERGENCIES AND DISASTER MANAGEMENT

COURSE OBJECTIVES: To enables the students to:

- Understand the emergency situations in natural and manmade disasters.
- Gain knowledge on nutrition surveillance and treatment in emergencies.
- Knowledge on planning nutrition relief and rehabilitation in emergencies.
- Explain concepts on Epidemiology and its application in planning programs during emergencies.

UNIT-I: Disasters

- Natural/Manmade disasters resulting in emergency situations: Famine, drought, flood, earthquake, cyclone, war, civil and political emergencies, Factors giving rise to emergency situation in these disasters.
- Nutritional problems in emergencies in vulnerable groups: Causes of malnutrition in emergency situations, Major deficiency diseases in emergencies, Protein – Energy Malnutrition / Starvation / Under Nutrition, Specific Nutrient deficiencies - Energy, Vitamins, Minerals
- Communicable disease: Surveillance and treatment. Control of communicable diseases in emergencies – Role of immunization and sanitation.

UNIT-II: Assessment

- Assessment and surveillance of Nutritional status in emergency affected populations: Scope of assessment of malnutrition in emergencies, Indicators of malnutrition. Clinical signs for screening acute malnutrition, Anthropometric assessment of nutritional status.
- Indicators and cut-offs indicating seriously abnormal nutrition situation: Weight for height based indices, MUAC, social indicators.
- Organization of nutritional surveillance and individual screening.

UNIT-III: Nutritional Relief and Rehabilitation

- Assessment of food needs in emergency situations, Food distribution strategy – Identifying and reaching the vulnerable group – Targeting Food Aid.
- Mass and Supplementary Feeding, Therapeutic Feeding, Special foods/rations for nutritional relief, Local production of special foods, Local foods in rehabilitation
- Organisation of mass feeding/general food distribution, Feeding centers, Transportation and food storage, Sanitation and hygiene, Evaluation of feeding programmes, Household food security and nutrition in emergencies
- Public nutrition approach to tackle nutritional problems in emergencies

UNIT-IV: Nutritional Epidemiology

- Introduction to Epidemiology – types of epidemiology, collection ofepidemiological data, secondary routine date, Descriptive epidemiology, Cross sectional Analysis, prevalence and incidence, risk factors, risks and odds, relative and attributable risks
- Principles of Nutritional Epidemiology, Measurement issues, Measurement of disease, Occurrence and Measurement of association, Exposure and outcome, Socio demographic and Psycho social variables.

UNIT-V: Epidemiological studies

- Design and Planning of Nutritional Epidemiological studies – assessing and supplying And Evaluating Epidemiological studies – Discussion of selected case studies

PRACTICALS:

- Collection of epidemiological data hands on experience.
- Selection and Rapid assessment of nutritional status in a community.
- Case study approach on causative factors and management of communicable diseases.
- Planning and formulation of nutrient dense foods.
- Survey on adherence to immunization schedule and vaccines.

REFERENCE BOOKS:

1) World Disasters Report – Focus on Public Health, International Federation of Red Cross and Red Crescent Societies.
2) Disasters – International Public Nutrition and Emergencies: The Potential for improving practice. Special Issue – Vol.23/4, Dec. 1999.
3) Guidelines and Research publications of OXFAM, WFP, Rome. 1999. Nutrient Requirements and Recommended Dietary Allowance for Indians A Report of the Expert Group of ICMR. 2010.
4) Dr.M Swami Nathan. (2010). Food and Nutrition Volume-2 Second Edition the Bangalore Printing and Publishing Co Ltd Bangalore 560018.
5) Shubhangini A.Joshi. (2010). Nutrition and Dietetics Third Edition Tata Mecgraw Hill Education Private Limited New Delhi.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Acquire knowledge on nutritional problems for natural and manmade disasters.	Understanding, applying and analyzing
CO2 Assess the nutritional status in emergencies	Understanding , analyzing and evaluating
CO3 Plan and execute nutrition rehabilitation in emergencies.	Creating, analyzing and evaluating
CO4 Acquire knowledge on nutrition epidemiology.	Understanding, applying and creating
CO5 Planning of different nutritional epidemiological studies	Applying, creating and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	3	2		1			1						3		3	1
CO2	1	2						3								2	1
CO3	1	3	1					3	2					1		1	1
CO4		1	3					2	1					2			2
CO5					3			1	1					1			

ELECTIVE FOUNDATION PAPER:

FSND2.4 C (22): APPLIED PHYSIOLOGY

COURSE OBJECTIVES: To enables the students to:

- Provide knowledge about various cells of the body
- Acquire information about immunity
- Learn about structure and functions of various systems

Unit- 1 Physiology, growth and development- concept and definitions, cell -cell theory, structure of cell, cell cycle; Mitosis and Meiosis, tissue and their functions.

Blood - Blood composition. erythropoiesis, Blood groups. Anemia. Homeostasis.

Unit-2 The immune system — Non specific defense mechanism: external and internal defense mechanism, specific defense Mechanism; Major histo compatibility complex (MHC) and antibodies. Innate immunity; phagocytosis. the complement system and Humoral mechanisms, Specific acquired immunity; Antibody mediated immune system (AMIS) and Cell mediated immune system (CMIS), the Leukocytes: Development and regulation. In-vitro detection of antigen — antibody reaction.

Unit 3 a) Gastro intestinal system — Description of GI tract, Mouth, Salivary glands, pharynx, Oesophages, stomach, pancreas, liver and Biliary system, small and large intestine. Gastro intestinal enzymes and hormones, absorption and utilization of carbohydrates, proteins and fats. Some common disorders of the Digestive system.

b) Renal system — organs of urinary system. Kidney: structure and functions, Renal function tests, pathophysciology of kidney. Dialysis and kidney transplant.

Unit 4 a) Cardiovascular system: Heart, Blood vessels and their control, cardiac out put, the cardiac cycle. Blood pressure, pathology of Hypertensions.

b) Respiratory system: organs of respiratory system. Mechanics of respiration, regulation of respiration and artificial respiration.

c) Homeostasis — body fluids, measurement of body fluid volumes, transport across cell membrane (passive transport and active transport) solute solvent Interaction.

Unit 5 a) Physiology of endocrine glands Hormones, endocrine glands, pituitary gland, pancreas. adrenal glands (adrenal cortex and adrenal medulla). Penal gland, thymus gland, kidney as an endocrine gland

PRACTICALS:

1) Blood: Composition-plasma, blood cells, blood clotting process.
2) Blood Analysis Enumeration of RBC and WBC.
3) Blood Hemoglobin
4) Blood Glucose
5) Serum Albumin and globulin
6) Serum Calcium
7) Serum Urea
8) Urine Analysis Qualitative Sugar, Albumin and Microscopy

REFERENCE BOOKS:

1) Vidya Ratan. 1993. hand Book of Human Physiology. 7th Edn. Noida: Jaypee brothers Medical Publishers (P) Ltd.
2) Bhavana Sabarwal. 1999. Health, physiology& Anatomy.New Delhi: Common Wealth Publishers.
3) Guyton and Hall. 2005. Text book of medical physiology. 1 I Edn. Noida: Gopsons papers Ltd.
4) Sembuhingam, K and Prema Sembulingam. 2002. Essentials of medical physiology.
5) Editions. Noida: Jaypee publications.
6) Genog, W.F. 2002. Review of medical physiology. 21t Edition. Noida.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Acquire knowledge on functions of various cells.	Understanding, remembering and evaluating
CO2 Assess the functions of immune bodies	Understanding , remembering and evaluating
CO3 Information on process of digestion, absorption and excretion	Understanding and remembering
CO4 Learn about cardiac cycle and respiratory process	Understanding, applying and remembering
CO5 Understand various secretions of endocrine glands	Understanding, applying and remembering

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1					**3**			**2**						3			**1**
CO2	**1**				**2**			**1**						2			
CO3					**3**			**2**						3			**1**
CO4					**3**			**2**						3			**1**
CO5	**1**				**2**			**1**						2			

PRACTICAL-I:

FSND 2.5 (22): NUTRITIONAL BIOCHEMISTRY& FOOD REGULATION AND QUALITY CONTROL

I

1. Quantitative analysis of Serum / Blood constituents
    - Blood glucose
    - Serum proteins
    - Serum Cholesterol
    - Serum Iron
    - Serum Phosphorous
    - SGOT (Serum Glutarnic Oxaloacetate Transaminase)
    - Serum Alkaline phosphatase
2. Urinary Estimations
    - Normal and abnormal constituents
    - Creatinine and Urea
    - Calcium
    - Phosphorous

II

1. Determination of threshold value for basic tastes
2. Odour recognition
3. Determination of threshold value for various odours
4. Perform preference tests: Paired Comparison
5. Perform discrimination tests: Duo-trio
6. Perform discrimination tests: Triangle
7. Perform discrimination tests: Ranking test
8. Selection of judging panel
9. Training of judges, for recognition of certain common flavour and texture defects using different types of sensory tests
10. Descriptive analysis methodology-Perform descriptive sensory test
11. Sensory evaluation of various food products using different scales, score cards etc.
12. Texture profile analysis of selected food product
13. Estimation of color of food product
14. Relationship between objective and subjective methods

PRACTICAL-II:

FSND 2.6 (22): FOOD PROCESSING AND PACKAGING TECHNOLOGY & ENTREPRENEURSHIP DEVELOPMENT

I

I. Preparation, packaging, storage and shelf life studies of following food products

1) Squashes and juices from locally available fruits
2) Mixed fruit jam, guava jelly, morabba, marmalade
3) Candied peels and jelly crystals
4) Tomato ketchup and green chilli sauce
5) Pickles and chutneys from mango, tomato, lime, carrots etc.
6) Dehydrated products from vegetables
7) Papads from sago, rice, dal
8) Salad dressings
9) Visit to packaging industry
10) Identification of different types of packaging and packaging materials
11) Determination of tensile strength of given material

II. Visits to: Food analysis laboratories, Bakeries, Food processing Industries & Food packaging industry

II ENTREPRENEURSHIP DEVELOPMENT

1) Case studies of women entrepreneurs (2 sessions)
2) Visits to enterprises run by women entrepreneurs and regional entrepreneurship support systems (3 sessions)
3) Development of Business plans (4 sessions)
4) Hands on experience in business (2 sessions)

THIRD SEMESTER

M.Sc. FOOD SCIENCE, NUTRITION & DIETETICS

SEMESTER-III

FSND 3.1(22): THERAPEUTIC NUTRITION

COURSE OBJECTIVES: To enables the students to:

- Enable the students to develop skills in planning calculation of therapeutic dietetics.
- Understand the need for Dietary Management in chronic disease condition.
- Acquire the skills in developing nutrition care plan.
- Develop skills in diet counseling in various disease conditions.

Unit -I

- Medical nutrition therapy – Introduction, important components and goals of nutrition therapy
- Nutritional management in pulmonary diseases: Chronic obstructive Pulmonary disease, cysticfibrosis, pneumonia, tuberculosis; causes, pathology, effect of malnutrition, nutritional management.

Unit -II

- Dietary Principles, Management and counseling for diseases of the liver – Jaundice, Hepatitis (A, B, C), Cirrhosis, functional tests
- Gall bladder - Cholecystis, Chole lithiasis.
- Pancreas - Pancreatitis

Unit -III

- Diabetes Mellitus: classification, Etiology, symptoms, Diagnosis, complications, Glycemic index, Dietary management of Diabetics, hypoglycemia.
- Inborn Errors of Metabolism Phenylketonuria (PKU), Maple syrup urine disease (MSUD), Galactosemia, Tyrosinemia, Homosystinuria.
- Overweight and Obesity: Classification, Etiology, assessment, factors affecting weight gain, Consequences. Management of Obesity- Dietary and Lifestyle Modifications, Preventive Aspects.

Unit -IV

- Diseases of the renal system: Renal Disorders-Nephrotic syndrome, glomerular nephritis, renal failure, Nephrolithiasis, urinary tract infection, dialysis.
- Atherosclerosis, Coronary Heart disease (CHD), Hypertension (HT), Congestive Heart Failure, Angina pectoris, myocardial infarction (MI), Rheumatic Heart Disease (RHD).

Unit -V

- Diseases of the Upper Gastro intestine - Gastro Esophageal Reflux Disease (GERD), Esophagitis, Hiatal Hernia.

- Diseases of the Stomach: Gastritis, Peptic Ulcer, Dumping syndrome.
- Diseases of intestine: Inflammatory bowel disease, Celiac disease, Irritable bowel syndrome, Short bowel syndrome
- Common GI problems: Diarrhea, constipation, Flatulence, Food sensitivities.

REFERENCE BOOKS:

1) Michael. J. Gibney etal; Clinical Nutrition Black well Science, 2005.
2) Shubhangini. A. Joshi; Nutrition and Dietetics, 3rd edition, McGraw Hill Education (India) Private Limited.
3) Srilakshmi . B; Nutrition Science, 15th edition, New Age International (p) Limited, publishers, 2016.
4) Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I and 11 2nd Edition, The Bangalore printing and publishing co., LTD. Reprint 2015.
5) Sunetra Roday; Food Science and Nutrition, 2nd edition, Oxford University press, 2013.
6) Carol Byrd – Bredbenner; Wardlaw's perspectives in Nutrition, 9th edition McGraw Hill International Edition, 2013.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Provide information about medical nutrition therapy and nutritional management pulmonary diseases.	Understanding, applying and analyzing
CO2 Information on dietary management on liver, pancreas and gall bladder	Understanding, remembering and applying
CO3 Learn about dietary management of lifestyle diseases and inborn errors of metabolism	Understanding, Remembering and evaluating
CO4 Know about dietary management of renal and cardiac disorders	Understanding, applying and evaluating
CO5 Understand about dietary management of diseases of gastro intestinal tract	Understanding, analyzing and creating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	1		3		1						3			1			3
CO2	1		3		1						3			1			3
CO3	1		3		1						3			1			3
CO4	1		3		1						3			1			3
CO5	1		3		1						3			1			3

FSND 3.2(22): FOOD MICROBIOLOGY AND TOXICOLOGY

COURSE OBJECTIVES: To enables the students to:

- Study the issues of Food safety, Food preservation and Food production.
- Learn about physical, chemical toxicants that contaminates food.
- Provide the most recent development in food packaging.

UNIT I: Introduction to Food Microbiology

- Classification and growth of microorganism, factors affecting microbial growth
- General characteristics, structure, classification, morphological characteristics, cultural characteristics of bacteria, mould and yeast.
- Role of Harmful and beneficial microorganisms in food.

UNIT II: Food Contamination and Spoilage

- General principles underlying spoilage: causes of spoilage, classification of foods based on spoilage and changes caused by microorganisms.
- Sources of contamination and types of spoilages among plant origin foods:
  - Cereals, Legumes, nuts and oil seeds
  - Fruits and Vegetable products
  - Spices and condiments

Food Contamination and Spoilage of Animal origin and Processed Foods

- Sources of contamination and types of spoilages among :
  - Milk and Milk products
  - Eggs, poultry and Meat
  - Fish and Other sea foods
  - Sugars and sugar products
  - Processed foods

UNIT-III:

Food Borne Diseases and Food Safety

- Food borne diseases – Food Infection and Intoxication Sources of infection of food by pathogenic organisms and physiological action, Signs and symptoms of various Bacterial Food-borne poisoning and Non-bacterial food-borne poisoning.
- Food safety: concept, factors affecting food safety, biological hazards.
- Applications of Food Microbiology- probiotics, prebiotics, microbial enzymes, fermentation process.

UNIT-IV:

Food Allergies and Sensitivities:

- Introduction, Immunological food hypersensitivities (true food allergies) - Mechanisms, Nature and chemistry of food allergens, avoidance of true food allergies, allergen cross-contact and its control and celiac disease.
- Non-immunological food sensitivities – Anaphylactoid reactions, metabolic food disorders and idiosyncratic reactions.

UNIT-V:

Food Toxicology:

- Classification of toxic agents, Principles, characteristics of exposure and evaluation of toxicity and Determination of toxicants in foods.
- Natural Toxins of different foods: Natural toxins in animal foodstuffs (meat and seafood), Natural toxins in plant foodstuffs, fungal toxins occurring in foods (mycotoxins), Bacterial toxins and its sites of action and their toxicity mechanisms.

REFERENCE BOOKS:

1) William.C.Frazier and Denni, S.C. Westhoff. (2004). *Food Microbiology*, 4th edition, Tata MCGraw-Hill publishing company Ltd, New Delhi.
2) Food Microbiology M.R.Adams
3) Basic Food Microbiology J.Banart
4) Modern Food Microbiology James Nd. Jay
5) Microbial Food Poisoning R. Hey
6) Practical Food Microbiology & Technology Mountv & Gould
7) Fermentation Fechnologv- Singli & Pandit
8) Food Toxicology - William Helferich, Carl K. Winter 2001
9) Handbook of *Food Toxicology*- Deshpande – 2002
10) *Food toxicology*: a perspective on the relative risks- Steven L. Taylor, Richard A. Scanlan, Institute of Food Technologists – 1989
11) Introduction to *Food Toxicology*- Takayuki Shibamoto, Leonard F. Bjeldanes - 2009

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Study the characteristics of microorganisms, factors affecting growth and Significance.	Understanding, remembering and analyzing
CO2 Learn about food contamination and spoilage	Understanding, applying and analyzing
CO3 Acquire knowledge on food borne infections	Understanding, Remembering and evaluating
CO4 Learn true and untrue food allergies and sensitivities and their control.	Understanding, remembering and evaluating
CO5 Study the classification of toxicants and techniques to identity toxic substances in foods.	Understanding, analyzing and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2		3		2									2			2
CO2	2		3		2									2			2
CO3	2		3		2						1			2			2
CO4	2		3		2						1			2			2
CO5	2		3		2				3		1			2			2

ELECTIVE PAPER -I

FSND3.3A (22): RESEARCH METHODOLOGY

COURSE OBJECTIVES: To enables the students to:

- Understand the importance of research methods and its applications
- Acquire knowledge on research process and preparing research projects

UNIT – I: Research Purpose and Types

- Research – Significance, meaning, objectives, Approaches,
- Research process, Criteria of good research, Variable- types
- Types of Research: Historical, descriptive, experimental, case study, survey research, participatory research, Fundamental, applied and action, exploratory research.
- Research hypothesis-Characteristics of good hypothesis.
- Research Design – Meaning, Need, Concepts, Principles and Types of research design

UNIT – II: Research Problem and Sample design

- Definition and Identification, Necessity and Selection of Research problem, Technique involved in defining the research problem.
- Population and Sample – Implications, Steps, Criteria and Characteristics of a good design
- Sampling Methods : *Probability sampling* - Simple random, systematic random sampling, two Stages and multi stage sampling, cluster sampling and *Non-probability sampling* - Purposive, quota and volunteer sampling / Snowball Sampling.

UNIT –III: Methods of Data Collection

- Primary and Secondary Data, Selection of appropriate method for data collection
- Different Methods and techniques of data collection - Interview, Observation, Social mapping, Participatory assessment Techniques, Observation check list, Questionnaire, Interview schedule, Group discussions, Case studies

UNIT –IV: Measurement Scales

- Measurement in Research, Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling, Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques

Unit - V

- Preparing a research project formulating project idea, general comments, defining the problem and setting objectives, literature search, data sources and collecting and preparing notes. .

REFERENCE BOOKS:

1) Aalan bryman, quantity and quality and social research, unwin hyman limited U.K.

2) Bajapai,S.Methods of social service and research
3) Basotia.G.Rand, Sharma.KK research methodology,Mangal Deep Publications, Jaipur 1999.
4) Burns. RB, Introduction to research methods, Saga publications pvt. 2000.
5) Davin W.Stewart, sercondary research-information sources and methods,saga publications.
6) Gary R.Beecher, human nutrition research, first edition 1979.
7) Kothari, research methodology-methods and techniques,Wishwa Prakasam New Delhi 2000
8) Misra RP, Research Methodology concept ,publishing Co., A/15-16 commercial block New Delhi-2001
9) Research made simple, A hand book of social workers, Raymond, Saga publications 1996.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Know about research types, variable and hypothesis.	Understanding, analyzing and evaluating
CO2 Learn about selection of research problem and methods of sampling	Understanding, creating and analyzing
CO3 Understand about methods and techniques of data collection	Understanding, creating and evaluating
CO4 Knowledge on measurement of scaling techniques	Understanding, analyzing and evaluating
CO5 Know the preparation of research proposal in appropriate scientific style	Understanding, creating and applying

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1			1	1	3	2		3					1				2
CO2			1	1	3	2		3					1				2
CO3			1	1	3	2		3					1				2
CO4			1	1	3	2		3					1				2
CO5			1	1	3	2		3					1				2

ELECTIVE PAPER -I

FSND3.3B (22): PROCESSING OF CEREALS, PULSES AND OIL SEEDS

COURSE OBJECTIVES: To enables the students to:

- To develop skills on processing of produce after postharvest.
- To develop knowledge on various preservation techniques applied in processing industries.
- To know the principles and methods involved in the processing of Non-Perishable foods.
- To acquaint with structure, composition and processing technologies for value addition of various cereals, pulses and oilseeds.

UNIT-I:

Cereals and Millets

- Structure and Composition of Cereals and Millets.
- Milling Technology - Small scale, large scale, Turbo milling process.
- Parboiling, Popping, flaking, Malting and Fermentation process of cereal grains.
- Biproducts, Breakfast cereals and RTE foods, Enrichment, Fortification.
- Physico chemical changes during soaking, germination, heating and malting.
- Value addition and Health benefits of millets.

UNIT- II:

Pulses and Legumes

- Structure and Composition of Pulses and Legumes
- Milling Technology - General Milling of Pulses and Legumes. Soaking and Germination. Products, Biproducts and Value-added products.
- Soya bean – Processing, soya isolates, soya concentrates and soya products.

UNIT III

Oil Seed Processing

- Oil seeds-classification, chemical composition, nutritional value and nutritional compounds and their removal methods.
- Milling- Ghanis, Hydraulic press, Solvent Extraction-methods.
- Milling quality and efficiency.
- Factors effecting on quality and efficiency, Desolventization.
- Refining of oils: Degumming, neutralization, bleaching, filtration, deodorization, winterization and hydrogenation of oils.

UNIT-IV

Products from Cereals Pulses and Oil Seeds

- Different by products from processing of cereals-Rice bran oil and uses of rice bran in food industry and pulses, their composition and nutritional value, Method of processing.

- Products from oil seeds – grits, nuggets, isolates, concentrates, low-cost protein foods, oils.

UNIT-V

Post Harvest Technology

- Post harvest losses, spoilage, causative factors, prevention and control measures.
- Equipment- machinery and tools required for processing of cereals, legumes, nuts and oil seeds.
- Quality control standards for Cereals, Legumes, Nuts and Oil seeds.

PRACTICALS:

1) Preparation of unfermented beverages.
2) Comparative moisture study on drying and dehydration of fruits and vegetables.
3) Preparation of fermented beverage.
4) Estimation of moisture content in foods.
5) Collection and identification of cereals.
6) Study on parboiling of paddy.
7) Collection and identification of millets.
8) Preparation of various millet products.
9) Processing of major & minor millets.
10) Collection and identification of pulses.
11) Preparation of Value added pulse products.
12) Collection and identification of oil seeds.
13) Extraction of oleoresins
14) Visit to commercial dhal mill.
15) Visit to modern rice mill.
16) Visit to oil extraction mill.
17) Visit to millet processing unit.

REFERENCE BOOKS:

1) Norman N Potter. (2007).Food Science, Fifth edition, An Aspen Publication, Mariland.
2) Peter C Morris and James H Bryce.(2004). Cereal Biotechnology, First Edition, Wood head publishing limited, Cambridge, England.
3) Subba Lakshmi G, and Shobha A. Udipi.(2001). Food Processing and preservation, New Age International (P) Ltd Publishers, New Delhi.
4) VijayaKhader. (2001).Text Book of Food science and Technology, Directorate of Information and publications of Agriculture, Indian Council of Agricultural Research, New Delhi.
5) Edwards, W.P.(2007).The science of Bakery Products, The Royal Society of Chemistry, Thomas Graham House, Cambridge.
6) Fast R.B. and Caldwell E.F. (1990). Breakfast cereals and how they are made?, American Association of Cereal Chemists" St Paul. MN.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Know about structure and milling technology of cereals and millets	Understanding, applying and creating
CO2 Understand about basic composition, structure and processing of pulses and legumes.	Understanding, remembering and analyzing
CO3 Know about basic composition, structure and processing of oil seeds.	Understanding, creating and evaluating
CO4 Prepare various food products including the by-products of cereal grains, pulses and oil Seeds.	Understanding, analyzing and applying
CO5 An in-depth understanding of the science and technology associated with post-harvest technology and processing of cereals, pulses and oilseeds.	Understanding, creating and applying

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	**2**		**3**		**2**	**2**								1	**1**		**2**
CO2	**2**		**3**		**2**	**2**								1	**1**		**2**
CO3	**2**		**3**		**2**	**2**								**1**	**1**		**2**
CO4	**2**		**3**		**2**	**2**								**1**	**1**		**2**
CO5	2		**3**		2	2								**1**	**1**		2

ELECTIVE PAPER -I

FSND3.3C (22): NUTRITION FOR HEALTH AND FITNESS

COURSE OBJECTIVES: To enable the students to:

- Define the concepts of Health, Nutrition, physical activity, physical fitness and methods of evaluation.
- Understand the Energy metabolism pathways during physical activity.
- Describe the role of macronutrients in physical performance, weight management and obesity.
- Explains the nutritional needs in different sports and the role of national agencies.

UNIT-I: Physical Fitness and its Evaluation

- Definitions- Nutrition, Health, Physical activity and Physical Fitness.
- Health benefits of Physical activity and Recommendations,
- Components of physical fitness to overall health-Cardiovascular Fitness, Muscular strength, Muscular Endurance, Flexibility, and Body composition.
- Assessment criteria of age specific fitness and health status- Evaluation of physical fitness- FITT Principles-Talk test, Target heart rate, Borg scale.

UNIT-II: Energy Metabolism in Physical Activity and Weight Management.

- Aerobic and Anaerobic metabolic pathways-ATP-Creatine Phosphate pathway (ATP-CP), Creatine Phosphate(CP), Lactic acid cycle, Glycolysis, Krebs cycle(TCA), Gluconeogenesis.
- Energy requirements and assessment of energy expenditure based on physical activity, Carbohydrate Loading.
- Special conditions- Weight management and Obesity-Dietary modifications-Restricted energy and fat diets, Low glycemic diets, Formula diets and meal replacement programs.

UNIT-III: Nutritional and Physical Performance

- Nutritional Requirements during Exercise- Carbohydrate, Fat, Protein-Recommendations-Before, During and After exercise.
- Carbohydrate utilization during exercise, Role of protein and fat in daily training and competitive performance.
- Vitamins and Minerals-Importance and Recommendations.
- Fluid–Recommendations, Importance and Consequences of Fluid balance. Hydration in pre, during and post exercise.

UNIT-IV: Sports Nutrition

- Classification of sports events and RDA for sports person.
- Nutritional requirements and special needs of sports person, pre, during, post sports events, water and electrolyte balance, ergogenic aids.
- Endurance and fatigue in sports performance.

UNIT-V: Kinanthropometry

- Assessment-Kinanthropometry**:** Definition; Introduction; Body size and proportion; Somatotyping; Circumferences; Skinfold measurement sites and determining body composition; Applications. Role of National agencies towards improvements of sports performance.

REFERENCE BOOKS:

1. Shils, M.E., Olson, J.A., Shike, N. and Ross, A.C. (Ed)(1999). Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
2. Whitney, E.N. and Rolfes, S.R.(1999). Understanding Nutrition, 8th Edition, West/Wadsworth, An International Thomson Publishing Co.
3. McArdle, W.Katch, F. and Katch, V. (1996). Exercise Physiology, Energy, Nutrition and Human Performance, 4th edition, Williams and Wilkins, Philadelphia.
4. Ira Wolinsky(ed) (1998). Nutrition in Exercise and Sports, 3rd Edition, CRC Press.
5. Mahtabs Bamji and N.Pralhad Rao. (2004).Text book of Human Nutrition, Second Edition, Oxford and IBH Publishing co. PVT LTD. New Delhi.
6. Heather Hedrick Fink, Alan E. mike sky. (2012). Practical Applications in Sports Nutrition, Third Edition, Library of Congress Cataloging in Publication Data. United States of America.
7. Michelle McGuire, Kathy A Beer Man. (2011). Nutritional sciences From Fundamental to Food, Second Edition, Wadsworth Cengage Learning, Belmont, USA

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Gain knowledge on concepts of physical activity and physical fitness.	Understanding, applying and remembering
CO2 Describe the energy metabolism pathways in physical activity.	Understanding and analyzing
CO3 List the role of macronutrients in physical performance	Understanding, remembering and evaluating
CO4 Demonstrate the importance of nutrients in Sports.	Understanding and applying
CO5 Gain knowledge on kinanthropometry.	Understanding, applying and analyzing

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1			1		2			2			2			1			2
CO2			1		2			2			2			1			2
CO3			1		2			2			2			1			2
CO4			1		2			2			2			1			2
CO5			1		2			2			2			1			2

ELECTIVE PAPER -II

FSND 3.4A (22): NUTRACEUTICALS AND FOOD BIOTECHNOLOGY

COURSE OBJECTIVES: To enable the students to:

- Study the processing of neutraceuticals, pharma foods, dietary supplements and non nutritive sweetness
- Study the importance of technologies and organisms for food biotechnology

UNIT-I

- Nutraceuticals– History, definitions, functional food versus pharmaceuticals, classification. Nutraceutical properties of nutrient components of foods:
- Pro active carbohydrates – Trehalose, poly saccharides, soluble fibers (pectin,guar gum and ß – glucons), insoluble fiber, resistant starches (their role in blood lipids, mineral absorption, control of blood glucose, risk of developing colon cancer), slowly digestible starches;
- Prebiotics – definition, inulin, oligo saccharides and lactulose as prebiotic compounds and polyphenols as prebiotics.

UNIT-II

- Nutraceutical properties of bioactive lipids – Butyric acid, medium chain fatty acids, long chain fatty acids (MUFA, PUFA, omega-3 and omega-6 fatty acids) and conjugated linoleic acid as nutraceuticals.
- Nutraceutical properties of bioactive peptides – Antihypertensive peptides, antilipidemic and antidiabetic peptides, opioid peptides, caseinophospho peptides, calmodulin – binding peptides, antioxidant peptides, anticancer and immune – modulating peptides, antithrombotic peptides; co-enzyme – Q10.
- Nutraceutical properties of bioactive polyphenols and carotenoids.

UNIT-III

- Nutraceutical properties of vegetables, fruits, nuts and oil seeds: Bio active components of tropical fruits and citrus fruits and berries and their functional properties;
- bio active compounds of cruciferous vegetables and their biological activities.
- Health benefits of olive oil and flax seeds.
- Nutraceutical properties of spices and herbs: Cinnamon, turmeric, ginger, garlic, onion, pepper fruit.
- Nutraceutical properties of foods from animal sources.
- Nutraceutical properties of miscellaneous foods: Seaweeds, tea and honey.

UNIT-IV

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

UNIT-V

- Genetically modified foods: concept, types and applications; safety assessment of genetically modified foods.
- Application of biotechnology to food products: Yeast based processes and products – alcoholic beverages, industrial alcohols, bread and related products.
- Bacteria based processes and products – dairy products, fermented meat and fish products, fermented vegetable products, vinegar and other organic products, bacterial bio mass.

REFERENCE BOOKS:

1) Birch G.G. &Parker, KJ. Nutritive sweetners - 2 applied sciences publishers, New Jersey, 1982.
2) Creighton, T-E. Proteins 2nd edition, W.H. Freeman &Company New York 1993.
3) Hettiarachahy, S.N Ziegler R.G. Protein function in food systems, It's basic symposium series, Hongkong, 1994.
4) National Research council Designing foods, (Animal product options in Marketplace) National academy press, Washington, 1988.
5) Parker, K.G.Green, T.H, Developments in sweetners. Applied sciences publisherws, London, 1983.

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COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Learn about the nutraceuticals verses pharma foods, pro active carbohydrates and prebiotics.	Understanding, applying and remembering
CO2 Know the nutraceutical properties of bioactive lipids and peptides	Understanding, analyzing and evluating
CO3 Acquire knowledge on nutraceutical properties of vegetables, fruits, nuts and oil seeds.	Understanding and remembering
CO4 Know about genetic engineering and bioinformatics	Understanding and applying
CO5 Understand about genetically modified foods and application of biotechnology in processing of food products.	Understanding, applying and analyzing

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	**1**		**3**	**3**	**2**								1				**1**
CO2	**1**		**3**	**3**	**2**								1				**1**
CO3	**1**		**3**	**3**	**2**								**1**				**1**
CO4	**1**		**3**	**3**	**2**								**1**				**1**
CO5	1		**3**	**3**	2								**1**				1

ELECTIVE PAPER -II

FSND 3.4B (22): HUMAN NUTRITION

COURSE OBJECTIVES: To enable the students to:

- Obtain depth in the study of nutrients
- Explore importance of nutrients for sustaining better health

Unit – I: Carbohydrates

- Carbohydrate metabolism and regulation,
- disorders related to carbohydrate metabolism, Inborn errors of carbohydrate metabolism;
- Glycemic and nonglycemic carbohydrates, glycemic response of foods - factors affecting glycemic index and measurement.
- Dietary fiber and non-starch polysaccharides- classification, digestion, absorption and mechanisms of health effects.

Unit – II: Proteins

- Protein and amino acid composition of foods
- amino acid metabolism and its regulation
- Protein turnover, factors influencing protein turnover- body size, age, metabolic rate, deficiency and imbalance of amino acid, pathological states
- Inborn errors of amino acid metabolism
- Protein quality evaluation of foods
- Computation of protein requirements of individuals.

Unit – III: Lipids

- Classification of dietary lipids, structural and physiological aspects
- Dietary lipid uptake, digestion – gastric and intestinal step, Absorption of lipids – role of small intestine; transport and secretion of lipids
- Postprandial lipid metabolism, disorders related to lipid metabolism;
- Essential fatty acids: functions and role in eicosanoid metabolism, deficiency conditions.

Unit – IV: Vitamins

- Fat soluble - A, D, E, K and water soluble- B and C vitamins - Nomenclature, dietary sources, digestion, absorption, bioavailability, transport and storage
- Loss in preparation and handling
- Functions and mechanisms of action; interaction with other nutrients, requirements, deficiency, toxicity and clinical assessment
- Vitamin antagonists in foods.

Unit – V: Minerals

- Minerals such as calcium, phosphorus, magnesium, iron, zinc, copper, cobalt, manganese, molybdenum, selenium, iodine and fluorine - Dietary sources, digestion, absorption, bioavailability, transport and storage;
- Functions and mechanisms of action, interaction with other nutrients, requirements, deficiency, toxicity and clinical assessment
- Mineral antagonists in foods.

REFERENCE BOOKS:

1) Groff JL and Gropper SS. Advanced Nutrition and Human Metabolism, Wadsworth Thompson Learning, USA. 2000.
2) Mc Clements DJ and Decker EA. Designing Functional Foods. Woodhead Publishing, USA. 2009.
3) Shills ME, Olson JA, Shike M and Ross CA (Eds). Modern Nutrition in Health and Disease, Lippincott Williams and Wilkins, London. 1999.
4) Gibney MJ, Macdonald IA and Roche HM. Nutrition and Metabolism, Blackwell Publishing, UK. 2003.
5) Forbes GB. Human Body Composition. Springer-Verlag, New York, U.S.A. 1987.
6) Vergroesen AJ and Crawford M (eds.). The Role of Fat in Human Nutrition, 2ndedn. Academic Press, London. 1989.

PRACTICALS:

1) Demonstration of blood glucose monitoring using glucometer.
2) Body composition analysis: Anthropometric and bioelectrical impedance methods.
3) Physical activity measurement using standard questionnaire.
4) Computation of total energy expenditure using factorial method.
5) Development of low cost protein food supplements and protein quality evaluation by computational method (PDCAAS).

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Describes about importance of carbohydrates	Understanding, applying and remembering
CO2 Gain knowledge on various functions of proteins	Understanding, analyzing and evaluating
CO3 Explains about classification and importance of lipids	Understanding and remembering
CO4 Provides awareness about various vitamins	Understanding, applying and evaluating
CO5 Explains about various biological roles of minerals	Understanding, applying and analyzing

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	**3**	**1**	**1**		**2**								2				**1**
CO2	**3**	**1**	**1**		**2**								2				**1**
CO3	**3**	**1**	**1**		**2**								**2**				**1**
CO4	**3**	**1**	**1**		**2**								**2**				**1**
CO5	3	**1**	**1**		2								**2**				1

ELECTIVE PAPER -II

FSND 3.4C (22): FOOD PRODUCT DEVELOPMENT AND MARKETING

COURSE OBJECTIVES: To enable the students to:

- Explore the techniques of food product development
- Provide awareness about functionality of food industries

UNIT I: New Food Products

- New food product: Definition, Characteristics, Need for New food product development.
- Classification: Line extensions - Repositioning of existing products - New form of existing product - Reformulation - New packaging - Innovative products - Creative products and Value added products

UNIT II: New Food product development in Food Industry

- Ideation: Idea generation, Sources, Screening, Feasibility studies.
- Consumer research.
- Product design and Formulation.
- Process development: Prototype development and scale up.

UNIT III: Quality assessment

- Quality assessment of new developed products -Sensory Evaluation-Shelf life Testing-Packaging and labeling Trends- Product life cycle
- Product Commercialization and Marketing: Costing and Pricing, Test Market, Product launching and Entrepreneurship.

UNIT IV: New food product development in food ingredient and service industry

- In Food Ingredient Industry: Characteristics, Consumers, Product development and Quality in food ingredient industry.
- In Food Service Industry: Characteristics, Consumers, Product development and Quality in food service industry.
- Ethics and Intellectual property/ Patents in food product development.

UNIT V: Specialty food products

- Health foods, Medical foods, Therapeutic foods, Herbal foods, Fortified foods.
- Infant foods, Geriatric foods, Sports drink.
- Functional foods, Designer foods and Neutraceuticals.
- Prebiotics, Prebiotics and Symbiotics.

PRACTICALS:

New Food Product Development and Marketing

1) Ideation,
2) Concept Development,
3) Market Research,
4) Formulation and Standarzation,
5) Acceptability studies,
6) Shelf life Studies,
7) Costing and Pricing,
8) Food and Nutrition labeling and packaging,
9) Development of Product Promotion Strategies,
10) Test Marketing.

REFERENCE BOOKS:

1) Andrew, J.Taylor.(2002). *Food Flavour Technology*, Sheffield Academic Press.
2) Debashri, Ray.(2002). *Nutritional Challenge and Total Quality Management*, 1st edition;Sarup and Sons, New Delhi.
3) Fuller, G.W.(1994).*New Food Product Development: From Concept to Market place*, CRC, Press, New York.
4) Graf, E. and Saguy, I.S. (1991).*Food Product Development: From Concept to the Market Place*, Van Nostrand Reinhold New York.
5) Man, C.M.D. and Jomes, A.A.(1994).*Shelf life Evaluation of Foods*, Blackie Academic and Professional, London.
6) Mike Stringer and Colin Dennis.(2002). *Chilled foods A comprehensive guide*, 2nd edition ,Woodhead publishing limited, Cambridge, England, 2000.
7) Oickle, J.G. (1990).*New Product Development and Value Added*, Food Development Division Agriculture, Canada.
8) Proc. Food Processors Institute: A key to Sharpening your Competitive Edge. Food Processors Institute, Washington, DC.
9) Rita Singh. (2004). *Food Biotechnology*. Volume 1, 1st edition, Global Vision publishing house, Delhi.
10) Shapton, D.A. and Shapton, N.F. (1991).*Principles and Practices for the Safe Processing of Foods*, Butterworth Heinemann Ltd, Oxford.

COURSE OUTCOMES: After completion of this course, students will be able to:

CO1 Explains about significance and need of new food product development.
CO2 Develop a design of food product development.
CO3 Make qualitative evaluation of new food product development.
CO4 Awareness about food service industries
CO5 Know about various special foods

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Explains about significance and need of new food product development.	Understanding, applying and evaluating
CO2 Develop a design of food product development.	Understanding, analyzing and evaluating
CO3 Make qualitative evaluation of new food product development.	Understanding and analyzing
CO4 Awareness about food service industries	Understanding and remembering
CO5 Know about various special foods	Understanding, applying and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	**1**		**3**	**3**	**2**									2			**2**
CO2	**1**		**3**	**3**	**2**									2			**2**
CO3	**1**		**3**	**3**	**2**									**2**			**2**
CO4	**1**		**3**	**3**	**2**									**2**			**2**
CO5	1		**3**	**3**	2									**2**			2

FSND 3.5 (22) THERAPEUTIC NUTRITION & FOOD MICROBIOLOGY AND TOXICOLOGY

I

1. Preparing: Equipment and educational material using in counseling and Assessment surveys.
2. Visit to general and specialized hospitals to observe and take case studies & history
3. Planning, calculation, preparation and counseling Sessions for;
    - Obesity
    - GIT disorders
    - Liver and Gall bladder and pancreas disorders
    - Cardio Vascular Diseases
    - Diabetes
    - Renal disorders
    - Pulmonary Disorders
4. Monitoring and Evaluation of counseling Sessions for above conditions.

II

1) Familiarization with Instruments used in Microbiological Lab, their principles and working.
2) Sterilization methods
3) Sampling techniques
4) Isolation techniques
5) Various types of media preparation and Methods of sterilization of media
6) Microbial Staining Techniques
7) Microbial examination of fresh food products: Identification, isolation and confirmation
8) Microbial examination of processed foods: Identification, isolation and confirmation.
9) Detection of E.coli from food sample
10) Analysis of food adulterants
11) Tests for food additives, food colours, heavy metals, pesticidal residues
12) Determination of Aflatoxin

FSND 3.6 (22): RESEARCH METHODOLOGY & NUTRACEUTICALS AND FOOD BIOTECHNOLOGY

I

1) Identification of different variables in specialization of study.
2) Framing of hypothesis-Null and alternate Hypothesis
3) Preparation of schedule/questionnaire.
4) Preparation of research proposal
5) Study of an article in a journal-Abstract, Methodology, Results and Bibliography

II

1) Market research analysis of nutraceuticals functional foods.
2) Product development of functional food.
3) Raw material testing
4) Selection and screening of panel for sensory evaluation of developed functional food.
5) Training of panel for sensory evaluation.
6) Conducting sensory tests and preparation of score cards
7) Ranking, rating, description and sensitivity tests and preparation of score cards
8) Shelf life studies on developed product.
9) Extraction and estimation of oil or crude fat content in oil seeds.
10) Estimation of total phenols and chlorogenic acid (Phenolic compound) in plant material.

FOURTH SEMESTER

M.Sc. FOOD SCIENCE, NUTRITION & DIETETICS

SEMESTER-IV

MANDATORY CORE

FSND 4.1(22): ADVANCED STUDIES IN NUTRITION

COURSE OBJECTIVES: To enable the students to:

- To acquire knowledge in new and emerging frontiers of Nutrition
- To acquire knowledge and skills in techniques of nutrient/food quality assessment using animal (Rats) models in Research.

UNIT I:

- Carbohydrates: Functions, Storage, effect of excess/low intake of carbohydrates, dietary carbohydrates and oral diseases.
- Lipids- Lipids and fatty acid- requirements, functions, storage, lipid transformation in the liver, lipotropic factors, role of essential fatty acids, prostaglandins, deposition of fat in the body, effects of deficiency and excess of fats.

UNIT II:

- Proteins and amino acids: Review of functions, sources, protein turnover, synthesis and stores, proteins as a source of energy, protein requirements through factorial method and balance study.
- Amino acids: Essential amino acids, amino acid balance and imbalance, toxicity, evaluation of dietary protein quality, effects of protein deficiency.

UNIT III:

- Energy measurement — direct and indirect calorimetry,
- Energy Expenditure: Physical activity, energy utilization in cells, basal metabolism, specific dynamic action of food.
- Energy requirements, energy balance and body weights.

UNIT IV: Nutrition and Immunity

- Innate and Acquired immunity – Primary and secondary immune response, Active and Passive, Antigen, Antibody Cell mediated immunity, Humoral immunity-Formation, maturation and activation of B and T cells, Immune effectors system- cytokines complement system, K cells and NK cells, Cell mediated effectors response,
- Role of nutrients in immunity
- Effect of malnutrition on immunity

UNIT V:

Nutrition, Brain and Behaviour

- Brain – Structure, composition and functions and neurological tests-EEG, PET, MRI.
- Neurotransmitters- Nutrient precursors of neurotransmitters – Tryptophan, tyrosine, choline and lecithin
- Role of neurotransmitters in Brain function
- Role of Nutrients on Brain growth and development

Endemic Nutrition Problems and their Management

- Flurosis – Aetiology, prevalence, symptoms and nutritional management
- Iodine deficiency disorders - Aetiology, prevalence, symptoms and nutritional management

Learning outcome:

- Calculate and/or define of diets for health conditions addressed by health promotion/disease prevention activities or uncomplicated instances of chronic disease of the general population.

REFERENCE BOOKS:

1) Berry. Ed. P. Ottaway, 1993. The Technology of vitamins in food. NZ: Blackie Academic & Professional..
2) David A Bender, Introduction to Nutrition & Metabolism,Second Edition
3) Erric Conn. Paul K. Stumpt, George Bruening and Roy.M. Doi 1987. "Outlines of Biochemistry 5/E". Canada: John Wiley & Sons.
4) Garrow Ed. Sanal. J. James W.P.T, 1993. Human nutrition & dietetics. U.K: Churchill livingstone publication
5) Henrietta Fleck, 1981. Introduction to Nutrition 4th edition Published by New York: Mcmillan Co.. INC.
6) Kenneth. Ed. T. Smith, 1988. Trace minerals in foods. New York: Marcel dekker, I tic.
7) Mullar .H.G. G.Tobin, 1980. Nutrition and food processing. East part connetict.: Avi publishing company INC
8) Hamintion — Glopper. Biochemistry of human Nutrition,. S.T.pauly MN: West publishing company.
9) M.S. Bamiji, N. Prahlad Rao and Vinodini Reddy . (1998). Text Book of Human Nutrition" Oxford and IBFI Publishing Co. Pvt. Ltd., New Delhi.
10) Baby Depuru. (1999). Some Selected Biochemical, behavioural and environmental correlates of Malnutrition in Children, U.G.C. S.V. University.
11) World Cancer Research Fund and American Institute for Cancer Research, "Food, Nutrition and the Prevention of Cancer - a global perspective". WCRF - America Institute of Cancer Research - Washington - 1997.

12) John. W. Kimball. (1990). Introduction to Immunology (Third edition) : Maxwell, Macmillan -International editions. Macmillan Publishing Company, New York.
13) Heather Hedrick Fink, Alan E. mike sky. (2012). Practical Applications in Sports Nutrition, Third Edition, Library of Congress Cataloging in Publication Data. United States of America.
14) Michelle McGuire, Kathy A Beer man. (2011). Nutritional sciences From Fundamental to Food, Second Edition, Wadsworth Cengage Learning, Belmont, USA.
15) N.Menta Nitin.J Menta. (2014).Nutrition and Diet for Children Simplified MeenakshiJ aypee Brothers Medical Publishers (P) Ltd.
16) Davidl. Katzwolters Kluwer/Lippin Cott Williams and Wilkins. (2007). Nutrition in Clinical Practice Second Edition.
17) C.Gopalan, B.V.Ramasastri and S.C.BalaSubramanian. (2012). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council Medical Research Hyderabad.
18) Madhu Sharma. (2013). Pediatric Nutrition in Health and Disease, Jaypee Brother's Medical Publishers (P) Ltd New Delhi London Philadelphia Panama.
19) Nutrient Requirements and Recommended Dietary Allowance for Indians A Report of The Expert Group of ICMR. 2010.
20) Dr.M Swami Nathan. (2010). Food and Nutrition Volume-2 Second Edition the Bangalore Printing and Publishing Co Ltd Bangalore 560018.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Acquire knowledge on functions, deficiencies of carbohydrates and fats.	Understanding, applying and analyzing
CO2 Know about novel proteins and classification of amino acids.	Understanding, analyzing and evaluating
CO3 Awareness about energy measurement of foods	Understanding analyzing and evaluating
CO4 Knowledge on types of immunity and role of nutrients	Understanding and remembering
CO5 Information about brain and neurotransmitters	Understanding and remembering

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	2	2	2	1									2			2
CO2	3	2	2	2	1									2			2
CO3	3	2	2	2	1									2			2
CO4	3	2	2	2	1									2			2
CO5	3	2	2	2	1									2			2

MANDATORY CORE

FSND 4.2(22): STATISTICS AND COMPUTER APPLICATIONS

COURSE OBJECTIVES: To enable the students to:

- To make the student to calculate and apply measures of location and measures of dispersion.
- To provide the student to apply discrete and continuous probability distributions to various problems.
- To Perform Test of Hypothesis.
- To Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.
- To Compute and interpret the results of Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test.

UNIT-I

- Meaning and scope of statistics-Role of statistics in research.
- Descriptive statistics – classification, tabulation, frequency distribution, diagrammatic and graphic representation, analysis, categorization, coding and sampling.

UNIT II:

- Measures of central tendency and dispersion (absolute and relative), skewness and kurtosis. Probability distributions, normal distribution, use of normal probability tables.
- Testing concepts of hypothesis,
- Formulation of hypothesis,
- Levels of significance.

UNIT III:

- Large sample tests for significance of difference between sample mean and population mean, difference of sample proportions and population proportions,
- true sample proportions,
- Small sample tests (test for significance of the difference between small sample mean and population mean).

UNIT IV:

- Correlation, co-efficient of correlation and its interpretation, rank correlation, regression equation and predictions,
- Chi-square test for goodness of fit and independent attributes,
- F- test (ANOVA)

UNIT V:

- Introduction to Computer-Block diagram, PC and its components, Memory capacity, Physical storage of data, various devices, Hardware and software operating- DOS commands for file handling.
- MS Office and its component – Word and its applications/ creating documents, editing spell check, auto correct and print preview, creating tables and sorting data in tables, mail merge and its usage.
- Excel – Data entry, data Analysis, Statistical functions in excel statistical packages in social sciences (SPSS).

REFERENCE BOOKS:

1) Fisher A.R. Yates.F. "Statistical table "6th Edition Longman group ltd, England, 1982.
2) Freud E.J.Smith, M.R. "Satatistics – a first course" 4th edition prentice –hall Inc.New Jersey.
3) Gupta S.P. "Sultan chand & sons, New Delhi, 1995.
4) Norma Gilbert "Statistics" 2nd edition, Holt saunders International.
5) Steel G D R ., Torrie, H.J."Principles and procedures of Statistics"2nd edition, M.hill International, 1981.
6) Welkowiz J.Ewen, B.R.Cohen.J."Introductory statistics for the behavioural Sciences"3rd edition, academic press, New York, 1982.
7) William.C.Hays, "Statistics" 3rd edition, Holt – Saunders International, 1980.
8) William C.Guenther "concepts of statistical inference" 2nd edition, Mc Graw Hill Internal 1981.
9) Verna,B.L, Sukla, Srivatava R.N."Biostatistics" CBS publishers &distributors, New Delhi, 1994.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Learn about descriptive statistics	Understanding, applying and analyzing
CO2 Information on central tendency and dispersion	Understanding, analyzing and evaluating
CO3 Demonstrate the ability to carry out statistical tests.	Understanding and analyzing
CO4 Acquire knowledge on stastical analytical techniques	Understanding and analyzing
CO5 Understand the about functions of computer	Understanding, applying and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1			**2**	**3**	**3**	**1**		**3**						2			**2**
CO2			**2**	**3**	**3**	**1**		**3**						2			**2**
CO3			**2**	**3**	**3**	**1**		**3**						**2**			**2**
CO4			**2**	**3**	**3**	**1**		**3**						**2**			**2**
CO5			**2**	**3**	3	1		3						**2**			2

ELECTIVE PAPER - I

FSND 4.3A (22): INSTITUTIONAL FOOD SERVICE MANAGEMENT

COURSE OBJECTIVES: To enable the students to:

- Understand different types and systems of food services.
- Acquire knowledge and skills in planning organizing and evolution of different types of public catering units in community.
- To build capacity for self employment.

UNIT I: Introduction to food service Industry

- Principles and functions of food service management.
- Need and importance
- Tools of Management.
- Management of resources.
- Types: Hotels and Restaurants - Hotels/Motels, restaurants, cafes, clubs, wine bars, specialty restaurants, fast foods, take-away, street foods.
- Welfare and Industrial - Residential establishments - School, colleges, hostels, old people House, Hospitals, nursing homes, Industrial canteens, Temple feeding and Marriage feeding.
- Transport - Railway, Airlines and Sea.

UNIT II: Infrastructure and Equipment in Food Institutions

- Building plans, outlays of work places - kitchen spaces, storage spaces and service areas.
- Equipment - Classification of equipment, selection of equipment, Design, installation, operation and maintenance.
- Menu – types of menu in Food service institutions, principles and planning
- Food services - mechanics of waiter service, self-service, vending and mobile catering.
- Food services systems - Introduction, Cook-chill system and benefits, Cook-freeze system and benefits and Souse-vide.
- Computers in food service - Introduction, catering controls.

UNIT III: Food safety in public catering

- Health and Hygiene of personnel.
- Laws governing food service in public catering.
- Sanitation of food service establishments.
- Food safety in hotels, restaurants, street foods, industry and canteens, hospitals, hostels, airlines, railways, temple and mass feeding programmes.
- Laboratory support services in food safety.
- Food safety awareness programmes to food handlers and consumers.
- Role of media in food safety education.

UNIT IV: Financial Management

- Definition and scope of financial management.
- Cost concept, cost control and pricing.
- Book keeping and accounting.

UNIT V: Personnel Management

- Recruitment, selection and Induction, Job analysis, description, Monitoring work.
- Employee facilities and benefits in service Training.
- Skills to operate and manage food service system.

REFERENCE BOOKS:

1) Ronald kinton and victor cesarani (1992), 'the theory of catering', Bulter and Tanner Ltd,, France and London.
2) Mohinisethi and surjeet Mohan (1993), catering management an integrated approach, second edition, wiley esteem limited, New Delhi.
3) Ramesh VBhat and R.Nagesswara Rao (1996), Food safety, Bappco (ltd), Mysore, Banglore.
4) Ramesh, V,Bhat, and R.Nagesswara Rao(1992), Food safety in public catering,NIN,1CM R, Hyderahad.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Learn about functions, tools and types of food service establishments.	Understanding, remembering and applying
CO2 Acquire knowledge on the food service institutions infrastructure, equipment, food service operations and systems.	Understanding and applying
CO3 Understand the role of food safety in personnel and laws in a variety of food service settings.	Understanding, applying and evaluating
CO4 Make use of the costing and financial management principles.	Understanding and analyzing
CO5 Perceive the sales promotion techniques.	Understanding, applying and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3			2	2		1		3			3		2			2
CO2	3			2	2		1		3			3		2			2
CO3	3			2	2		1		3			3		2			2
CO4	3			2	2		1		3			3		2			2
CO5	3			2	2		1		3			3		2			2

ELECTIVE PAPER - I

FSND 4.3B (22): GERIATRIC NUTRITION

COURSE OBJECTIVES: To enable the students to:

- Understand physiological and biochemical changes during old age
- Acquire knowledge on health issues during old age.

UNIT-I:

- The process of Ageing
- Physiological biochemical and body compositional changes
- Theories of ageing
- Socio-cultural and psychological aspects of ageing
- Health seeking behaviour of the elderly

UNIT-II:

- Food and Nutritional needs of the elderly – Dietary management
- Special problems of women – menopausal and post-menopausal
- Problems- Early nutrition and nutrition and health in later years

UNIT-III:

- Chronic degenerative diseases and nutrition and health problems of the elderly
- Their etiology, genesis life style and living condition, management, prevention and control

UNIT-IV:

- Nutritional deficiency disorders: Deficiencies and management of carbohydrates,
- Proteins
- Fats
- Vitamins and minerals

UNIT-V:

- Policies and programmes of the government and NGO sectors pertaining to the elderly - Old age homes
- Day care and recreation centers – their need and scope

REFERENCE BOOKS:

1) Kumar, V. (1996): Aging – Indian Perspective and Global Scenario, Proceedings of International symposium of Gerontology and Seventh Conference of the Association Gerontology (India)
2) Bagchi, K.and Puri, S. (Ed)(1999): Diet and Aging-Exploring Some Facets, Soc. For Gerontological Research, New Delhi and Help Age India, New Delhi.
Chaudary, A. (Ed)(2001): Active Aging in the New Millennium, Pub. Anugraha, Delhi.
3) Shils, M.E., Olson, AJA., Shike, M. and Ross, A.C.(Ed)(1999): 9th Edition, Williams and Wilking.
4) Sharma, O.P. (Ed.) (1999): Geriatric Care in India – Geriatrics and Gerontology: A Textbook, M/S. ANB Publishers.

5) Aiken, L.R.(1978): The Psychology of Later Life, Philadelphia WB Saunders Company.
6) Chowdhry Paul D. (1992): Aging and the Aged Inter India Pub., New Delhi.
7) Cox Harold (1984): Later life: The Reality of Aging, New Jersy, Perentice Hall Inc.
8) Watson, R.R.(ed)(2000) Hand book of Nutrition in the Aged. 3rd edition, CRC Press,Boca Raton
9) Nutrition Screening Initiative (1991 and 1992). Nutrition Screening Manual for Professionals Caring for Older American.Washington, D.C. Green Margolis, Mitchell, Burns and Associates.
10) Chemoff, R.(ed)(1991). Geriatric Nutrition: The Health Professional' Handbook, Gaithersburg. MD: Aspen
11) The Nutrition Screening Initiative (1994). Incorporating Nutrition Screening and Interventions into Medical Practice: A Monograph for Physicians.
12) Watson, R.R.(ed).(1985).CRC Handbook of Vitamins in the Aged ERC Press, Boca Raton, Florida
13) Berg, R.L. and Casells, J.S.(1990). The Scond Fifty Years: Promoting Health and Preventing Disability Washington E.C. National Academy Press.
14) Mahtabs.Bamji and N.PralhadRao . (2004). Text book of Human Nutrition, Second Edition, Oxford and IBH Publishing co. PVT LTD. New Delhi.
15) Heather Hedrick Fink, Alan E. mike sky. (2012). Practical Applications in Sports Nutrition.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Understand various changes in body and body fluids.	Understanding, remembering and applying
CO2 Awareness about dietary management for elderly	Understanding applying and analyzing
CO3 Knowledge about degenerative diseases among elderly	Understanding, applying and evaluating
CO4 Information about management of nutritional deficiencies	Understanding, creating and analyzing
CO5 Awareness about various programmes	Understanding, applying and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	3	2		1						3			3	2		2
CO2	2	3	2		1						3			3	2		2
CO3	2	3	2		1						3			3	2		2
CO4	2	3	2		1						3			3	2		2
CO5	2	3	2		1						3			3	2		2

ELECTIVE PAPER - I

FSND 4.3C (22): BAKING TECHNOLOGY

COURSE OBJECTIVES: To enable the students to:

- Understand the concept and technology of baking.
- Learn the role of different ingredients in baking process
- Familiarize with processing techniques of various bakery products
- Develop skills in organizing and maintenance of a baking industry.

UNIT-I: Bakery Industry

- Introduction, current status, growth rate, and economic importance of Bakery Industry in India.
- Baking: Principles, baked foods, Baking temperatures, Knowledge and working of various types of oven, baking equipment; Roasting: Principles of roasting, roasting equipment;
- Formulations, processing (mixing, fermentation, rounding, proofing, sheeting, moulding, baking, depanning etc.), equipments, packaging, storage and quality testing of bakery products

Unit-II: Bakery equipment:

- Selection of equipment-mixtures, agitators.
- Accessory equipment – dough cutters, rollers, moulders, sheeters, proofing equipments.
- Oven – types of ovens, care and maintenance of equipment.

UNIT-III: Baking Technology

- Types and grades of wheat flour, Wheat flour proteins and importance of gluten in manufacture of bakery products.
- Role of ingredients in bakery products- sugars, fats, leavening agents, additives and other ingredients.
- Types of Bakery Products and Technology for their Manufacture – dough and batters; Dough rheology.

UNIT-IV: Bakery Products

- Hard wheat Products: bread- Ingredients, various types of bread, equipments and types of mixing methods, preparation of bread, Product quality characteristics, faults and corrective measures of bread.
- Soft wheat Products: cookies, crackers, biscuits– Ingredients, types, equipments, method of preparation, Product quality characteristics, faults and corrective measures.
- Ingredient used in Cake Making, types and varieties, equipments, cake making methods, Product quality characteristics, faults and corrective measures of cakes.
- Other bakery products: using very hard wheat. Pizza, pastry and its types.

UNIT- V: Modified Bakery Products

- Modified bakery products: high fiber, low sugar, low fat, gluten free bakery products.
- Decoration of baked foods – Icing and Fillings, its types and applications in bakery. Role of other ingredients used in icing and fillings.
- Staling and Nutrient Losses in Bakery Products.

PRACTICALS:

1) Introduction of tools and equipments of bakery products.
2) Determining the gluten content.
3) Preparation of Biscuits and Cookies.
4) Preparation of Doughnuts and Muffins.
5) Preparation of Bread and Bun.
6) Preparation of Pizza.
7) Preparation of various Types of Cakes.
8) Preparation of Filling and Icings.

REFERENCE BOOKS:

1) Dubey, S.C. (2007). Basic Baking 5th Ed. Chanakya Mudrak Pvt. Ltd.
2) Manay, S. & Shadaksharaswami, M. (2004). Foods: Facts and Principles, New Age Publishers
3) Hebeda, R. (Ed.). (1996). *Baked goods freshness: Technology, evaluation, and inhibition of staling* (Vol. 75). CRC Press.
4) Manley, D. (Ed.). (2011). *Manley's technology of biscuits, crackers and cookies*. Elsevier.
5) Vaclavik, V. A., Christian, E. W., & Campbell, T. (2008). *Essentials of food science* (Vol. 42). New York: Springer.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Acquire knowledge on bakery industry and products.	Understanding, applying and remembering
CO2 Acquire knowledge on bakery equipment	Understanding applying and creating
CO3 Comprehend the technology of processing of bakery products.	Understanding, applying and evaluating
CO4 Demonstrate the skills in various types of bakery items.	Understanding, creating and analyzing
CO5 Comprehend the technology of processing in handling the bakery.	Understanding, applying and analyzing

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	**3**		**2**	**2**	**2**		**3**							2			**2**
CO2	**3**		**2**	**2**	**2**		**3**							2			**2**
CO3	**3**		**2**	**2**	**2**		**3**							**2**			**2**
CO4	**3**		**2**	**2**	**2**		**3**							**2**			**2**
CO5	3		**2**	**2**	2		**3**							**2**			2

ELECTIVE PAPER - II

FSND 4.4A (22): NUTRITIONAL STATUS ASSESSMENT METHODOLOGIES

COURSE OBJECTIVES: To enable the students to:

- To acquire skills in Nutritional status assessment of different age groups.
- To learn to compare the results with standards and identify the gaps in nutrition.
- To know the methods of assessing tools for feasibility, reliability and validity.

Unit I:

- Nutritional status- meaning, indicators.
- Nutritional Surveillance: Need, determinants, Nutritional Surveillance, methods of assessment of Nutritional status-Direct and Indirect methods.
- Role of National Nutrition Monitoring Bureau (NNMB).

Unit -II

- Anthropometry: Meaning, importance, methods, measurement of Height, Weight
- Mid- Upper- arm circumference, Head circumference, Chest circumference,
- Fat folds triceps and sub scapular assessment tools and techniques.
- Reference standards for comparison, classification of Nutritional Status.

Unit -III

- Diet survey: Meaning and significance
- Methods - Food Balance Sheet Method, Inventory Method, Weighment Method, Expenditure Pattern Method, Diet history, Oral Questionnaire Method, Duplicate Sample Method, Dietary Score Method, Recording Method and Standardization of Dietary Assessment Vessels.
- Analysis and interpretation, problems in dietary surveys and management.
- Vital statistics and other Records

Unit - IV

- Clinical assessment: Methods and Techniques for Clinical Assessment of Nutritional Status and diagnosis of signs and symptoms in relation to various nutrient deficiencies.
- Biochemical Assessment: Need and importance, Laboratory tests, Protein Energy Malnutrition. Essential Fatty Acids. Fat Soluble Vitamins, Water soluble vitamins, minerals and trace elements. Normal levels for comparison.
- Biochemical assessment in diseased and normal state.

Unit – V

- Growth and Metabolic Studies.
- Principles, objectives.
- Growth studies with infants on feeding different protein sources. (case study experiences and report of research studies)
- Growth studies with preschool children, school children and adolescents: Effect of supplementation
- Nitrogen balance studies, in growing children, adolescents and adults- Procedure for conducting metabolic and balance studies and interpretation of results.

REFERENCE BOOKS:

1) Mahtab S. BamjI .1999. Textbook of Human Nutrition. Oxford & IBH publishing Co. Pvt.Ltd..
2) Park and Park .1983. A textbook of preventive and social medicine, M/s. Banrasidas Bhanot publishers.
3) Robinson, Collier,1979. Fundamentals of Normal Nutrition, Mac. Millan International edition.
4) Shukla P.K, 1982. Nutrition Problems of India,, Prentice Hall of India.
5) Tara Gopaldas and Subadra Seshadri. 1987. Nutrition, monitoring and assessment. Oxford University press.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Provide knowledge on nutritional surveillance	Understanding, applying and analyzing
CO2 Learn the techniques of anthropometry	Understanding applying and evaluating
CO3 Assess skill in diet survey	Understanding, applying and creating
CO4 Students learn clinical signs and biochemical tests for diseased and normal state.	Understanding, applying and analyzing
CO5 Acquire knowledge on growth and metabolic studies	Applying, analyzing and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1					1	2			1		1			2			2
CO2					1	2			1		1			2			2
CO3					1	2			1		1			2			2
CO4					1	2			1		1			2			2
CO5					1	2			1		1			2			2

ELECTIVE PAPER - II

FSND 4.4B (22): PUBLIC HEALTH NUTRITION

COURSE OBJECTIVES: To enable the students to:

- Gain insight into the public health problems and their implications.
- Acquire skills in organizing and evaluating nutrition projects in the community.
- Appreciate the national and international contribution towards nutrition improvement in India.
- Apply different assessment techniques for nutritional screening.

Unit- I: Public Health Nutrition – An Overview

- Concept and importance of public health nutrition
- Public health issues and problems
- Health care system in India
- Role of public nutritionist in health care delivery

Unit-II: Strategies to combat Public Health Problems

- Improving food and nutrition security - Green White and Blue revolution
- Nutrition education - Principles of planning –, where, when, whom, Kitchen garden, food fortification, food enrichment, PDS, PHC

Unit-III: National Nutrition Intervention programmes

- National Nutrition Policy Preschool feeding programme, ICDS, MDM, SNP, WNP, ANP, BNP, NNAPP, FNB, NIDDCP
- National Program for Prevention of Blindness due to Vitamin A Deficiency

Unit-IV: International Nutrition Intervention programmes

- International organizations concerned with food and nutrition: FAO, WHO, UNICEF, CARE, AFPRO, CWS, CRS World Bank and others.

Unit-V: Strategies to combat malnutrition

- National organizations concerned with Food and Nutrition: ICMR, ICAR, CHEB, CSWB, SSWB
- Economics of Nutrition: Malnutrition and its economic consequences; Economics in Nutrition – Food security, food production and food pricing.

REFERENCE BOOKS:

1) Gulani, K.K. 2005. Community Health Nursing. 1st Edition. Kumar Publishing House. New Delhi. Pp – 662 to 664.
2) Gupta M.C., Mahajan B.K. 2003. Textbook of Preventive and Social Medicine. Third Edition. Jaypee Brothers Medical Publishers. New Delhi. India. Pp- 355-357.

3) Kishore J. 2007. National Health Programmes of India.7th Edition Century Publication. New Delhi.Pp- 340-361.
4) .Oxford textbook of Public Health Ed. Roger Detels, James Mcewen, Robert Beaglehole,andHeizo Tanaka Oxford University Press (OUP) 4th Edition: 2002.
5) Public Health at the Crossroads – Achievements and Prospects. Robert Beaglehole and Ruth Bonita 2nd Edition Cambridge University Press
6) Maxcy-Rosenau-Last Public Health & Preventive Medicine, Fourteenth Edition Ed RobertWallace, MD, et al.
7) Epidemiology and Management for Health Care: Sathe , P.V. Sathe, A.P., Popular Prakashan, Mumbai, 1991
8) International Public Health: Diseases, Programs, Systems, and Policies by Michael Merson, Robert E Black, Anne J Mills - Jones and Bartlett Publishers
9) Preventive and Social Medicine, K Park, Bansaridas Bhanot Publishing House.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Demonstrate systematic knowledge and understanding of the commonly occurring nutritional problems.	Understanding, applying and analyzing
CO2 Students will able to know strategies to combat public health problems	Understanding analyzing and evaluating
CO3 Gain awareness on the basic nutrition intervention programmes by national organizations.	Understanding, creating and evaluating
CO4 Gain awareness on the basic nutrition intervention programmes by international organizations.	Understanding, applying and analyzing
CO5 Describe the various strategies to combat malnutrition.	Remembering, creating and evaluating

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	**2**				**1**			**3**	**3**					2			**2**
CO2	**2**				**1**			**3**	**3**					2			**2**
CO3	**2**				**1**			**3**	**3**					**2**			**2**
CO4	**2**				**1**			**3**	**3**					**2**			**2**
CO5	2				1			3	**3**					**2**			2

ELECTIVE PAPER - II

FSND 4.4C (22): PROCESSING OF FRUITS AND VEGETABLES

Hours of instruction/Week

Theory: 5 hrs.

Practical: 3hrs

COURSE OBJECTIVES: To enable the students to:

- To acquaint with the proper handling technologies of fruits and vegetables to reduce postharvest losses.
- Aware students on postharvest changes in fruits and vegetables.
- To develop knowledge on storage structures of Fruits and vegetables.
- To acquire knowledge on biochemical changes during fruit maturity.

Unit- I: Introduction of processing of fruits and vegetables

- Introduction, definition, importance and status of post harvest technology.
- Classification and composition of fruits and vegetables and their nutritional significance; climacteric and no-climacteric fruits; preharvest factors influencing post-harvest physiology, post harvest handling, precooling methods, post harvest treatments, edible coatings.
- Physical and chemical indices of fruit maturity, crop maturity and ripening, bio-chemical changes during maturation, ripening, processing and storage.

Unit- II: Methods of storage and Pre-processing operations:

- Refrigerated, CA, MA and hypobaric storage, MAP recent developments, advances, role of gases, influence of MAP on microorganisms, advantages, disadvantages.
- Washing, blanching, peeling, sorting and grading of fruits and vegetables; minimal processing of fruits and vegetables; quality factors for processing, export standards, fruit product order (FPO).

Unit – III: Technology of fruit formulations:

- Jam, jellies, marmalades, specifications, role of pectin and theories of gel formation.
- Technology for juice pressing, juice extraction and clarification, methods of bottling, enzymatic clarification and debittering of juices, physiological and enzymological aspects of fruit juice production, fruit juice concentrates and powders- preparation and specifications, packaging.
- Fruit juice beverages, squash, cordial, crush, RTS, nectar, syrups, blending of juices.

Unit – IV: Technology of tomato products:

- Sauce, puree, ketchup and tomato paste.
- Fruit preserves and candied fruits, dehydrated fruits & vegetables, spoilage of processed products.
- Canning of fruits and vegetables, preparation of syrups and brines, spoilage of canned fruits and vegetables.

Unit –V: Stages of new product development from fruit and vegetable wastes:

- By products from fruit and vegetable wastes, utilization and disposal of fruit industry wastes.
- Production of mushroom and its processed products.
- Cashew and coconut: chemical composition, processing technology and their processed products.

RECOMMENDED BOOKS:

1) R.P.Srivastava and Sanjeev Kumar (2001) : Fruit and Vegetable Preservation – Principles and Practices, Third edition, International Book distributing Co. Lucknow (India)
2) A.K.Thompson (2003): Fruit and Vegetables – Harvesting, handling and storage. 2nd edition Blackwell Publishing.
3) Er. B. Pantastico: Post harvest Physiology, handling and utilization of tropical and subtropical fruits and vegetables. AVI Publishing Company, Inc.
4) W.V Cruess (1997): Commerical Fruit and Vegetable Products. Allied Scientific Publishers. Bikaner (India)
5) Girdharilal (1996) Preservation of Fruits and Vegetables. ICAR, New Delhi
6) Dauthy, M.E. 1997. Fruit and Vegetable Processing. International Book Distributin Co. Lucknow, India.
7) Hamson, L.P. 1975. Commercial Processing of Vegetables. Noyes Data Corporation, New Jersey.
8) Dauthy, M.E. 1997. Fruit and Vegetable Processing. International Book Distributing Co. Lucknow, India.

COURSE OUTCOMES ACCORDING TO BLOOM'S TAXONOMY LEVELS:

Course Outcomes	Bloom's Taxonomy Levels
CO1 Understanding postharvest treatments and processing of fruits and vegetables.	Understanding, applying and evaluating
CO2 Student develops skills on methods of storage.	Analyzing and evaluating
CO3 Enhance their knowledge on technology on processing of fruit products.	Creating and evaluating
CO4 Inculcates knowledge on technology on tomato products.	Applying, analyzing and evaluating
CO5 Awareness on new product development from fruit and vegetable wastes	Creating and analyzing

CO-PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	1		3				1		2					2			2
CO2	1		3				1		2					2			2
CO3	1		3				1		2					2			2
CO4	1		3				1		2					2			2
CO5	1		3				1		2					2			2

PRACTICAL-I:

FSND 4.5 (22): ADVANCED STUDIES IN NUTRITION& INSTITUTIONAL FOOD SERVICE MANAGEMENT

I

1) Animal experiments and growth study (Optional).
2) Human growth studies on HIG, LIG Children.
3) Prepare and demonstrate different recipes related to Nutritional deficiencies in adopted villages

II

1) Survey of different types of food service establishments
2) Portioning, costing and multiplication of the recipes.
3) Practice in preparation of volume meals at different costs for different service.
4) Cyclic menu planning for various food service systems.
5) Exercise on preparation of work schedule
6) Visit to the following types of Hotels/restaurants, welfare, industrial and transport.
7) Layout design (equipment personnel and organizational setup) of food service institutes.

PRACTICAL-II:

FSND 4.6 (22): STATISTICS AND COMPUTER APPLICATIONS & NUTRITIONAL STATUS ASSESSMENT METHODOLOGIES

I

1) Graphic and diagrammatic presentation of data.
2) Calculation of Averages- Arithmetic means, mode and median.
3) Calculation of Standard deviation and‘t’ test for large and small samples.
4) Calculation of Correlations, Regressions
5) Calculation of chi square to find out significance of association.

II

I. DIRECT METHODS:

1) Standardization of Dietary Assessment Vessels/cups
2) Diet survey:
   - Weighment method
   - Oral questionnaire
   - Demonstrations of other methods.
3) Anthropometric measurement for Pre- school children.
4) Clinical assessment- Examination of clinical signs and symptoms in children and adolescents in diseased state
5) Bio-chemical assessment: Blood drawing technique, Estimation of Hemoglobin, creatinine and albumin

II. INDIRECT METHODS:

Application of Participatory Rural Appraisal Techniques: Food Resource Mapping, Frequency of Food Intake Matrix.

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