Savitribai Phule Pune University, Pune

PROGRAMME:

M.Sc. Food Science and Nutrition

as per NEP 2020

Implemented from the

ACADEMIC YEAR: 2024–25

(for affiliated colleges also)

PROGRAMME STRUCTURE

M.Sc. Food Science and Nutrition

Cumulative Credits for One Year Post-Graduate Diploma=44

Cumulative Credits for Two Years Post-Graduate Degree =88

Total Number of Credits: 88

Course Code	Course Title		Number of Credits
Semester I:MajorCoreCourses(FSN-501-MJ TO FSN-504-MJP)			
FSN-501-MJ	Human Nutrition		4T
FSN-502-MJ	Food Science		4T
FSN-503-MJ	Human Physiology		2T
FSN-504-MJP	Practical-I		4P
Semester I: Major Core Courses Credits			**14(10T+4P)**
Semester I: Major Elective Courses (FSN-510-OE to FSN-513-OEP)			
FSN-510-OE	Food Service Management	Group A	2T
FSN-511-OEP	Food Service Management(Pr)		2P
FSN-512-OE	Nutrition Exercise and Fitness	Group B Select any	2T
FSN-513-OEP	Nutrition Exercise and Fitness		2P
Semester I:Major Elective Courses Credits			**4T/P**
Major Compulsory Course			
FSN-541-RM	Research Methodology		4T
Total cumulative credits required for Semester I			**22**
Semester II: Major Core Courses (FSN-551-MJ to FSN-554-MJP)			
FSN-551-MJ	Nutrition through life cycle		4T
FSN-552-MJ	Therapeutic Nutrition		4T
FSN-553-MJ	Nutritional Biochemistry		2T
FSN-554-MJP	Practical-II		4P
Semester II: Major Core Courses Credits			**14(10T+4P)**
Semester II: Major Elective Courses (FSN-560-OE to FSN-563-OEP)			

FSN-560-OE	Food Microbiology	Group A	2T
FSN-561-OEP	Food Microbiology		2P
FSN-562-OE	Public Health and Nutrition	Group B Select any 1	2T
FSN-563-OEP	Public Health and Nutrition (Pr)		2P
Semester II: Major Elective Courses Credits			**4T/P**
Semester II: Major Compulsory Course : Internship/On-Job-Training			

FSN-581-OJT	Internship/On-Job-Training	4P
Total credits required for semester II		**22**
Total cumulative credits at the end of year one (Sem I and II)		**44**

Semester III			
Course Code	**Course Title**		**Number of Credits**
Semester III : Major Core Courses (FSN-601-MJT to FSN-604-MJP)			
FSN-601-MJ	Food Processing		4T
FSN-602-MJ	Advanced Nutrition		4T
FSN-603-MJ	Functional Foods		2T
FSN-604-MJP	Practical III		4P
Semester III : Major Core Courses Credits			**14 (10T+4P)**
Semester III: Major Elective Courses(FSN605OEtoFSN608OEP)			
FSN-605-OE	Food Hygiene Sanitation	Group A	2T
FSN-606-OEP	Food Hygiene Sanitation Practical		2P
FSN-607-OE	Food Safety and Quality Control	Group B Select any I	2T
FSN-608-OEP	Food Safety and Quality Control		2P
Semester III: Major Elective Courses Credits			**4T/P**
Major Compulsory Course (FSN-609-RP)			
FSN-631-RP	Research Project I		**4P**
Total cumulative credits required for Semester			**22**

III	
Semester IV : Major Core Courses (FSN-651-MJ To FSN-653-MJP)	

FSN-651-MJ	Clinical Nutrition and Patient Counseling	4T
FSN-652-MJ	Sports Nutrition	4T
FSN-653-MJP	Food Analysis	4P
Semester IV : Major Core Courses Credits		**12(8T+4P)**

Semester IV: Major Elective Courses (FSN-654-OE to FSN-657-OEP)			
FSN-654-OE	Pediatric Nutrition	Group A	2T
FSN-655-OEP	Pediatric Nutrition		2P
FSN-656-OE	Food Product Development	Group B Select any 1	2T
FSN-657-OEP	Food Product Development		2P
Semester IV: Major Elective Courses Credits			**4T/P**
Major Compulsory Course(FSN-681-RP)			
FSN-681-RP	Research Project II		**6P**
Semester IV: Cumulative Credits			**22**
Total Second-Year Cumulative Credits			**44**
Two Years-4 Semesters Award M.Sc. Food Science and Nutrition Degree on completion of 88 credits			

M.Sc. Food Science and Nutrition

COURSE OBJECTIVE

The master's program (Food Science and Nutrition) aims to empower students with essential skills in diet planning applying the dietary guidelines. During the two years programme, students will gain adequate exposure to plan diets for normal or modified nutritional requirements through the life cycle, different clinical conditions and for athletes. Seminars, workshops and internship equip students to be placed in hospital or food service settings. For those interested in research, the course provides training in nutrition research methods and techniques. These skills make them eligible for a career in national and international food sectors, public health nutrition agencies and organizations.

Eligibility:

B.Sc. (Home Science), B.Sc.(Food Science and Quality Control), B. Sc. in Life Sciences MBBS, BAMS, BHMS, BUMS, BDS, B.Pharm.

Human Nutrition FSN-501-MJ

Credits-4 TeachingHours-60

Internal Marks -30 External Marks-70

Course Outcomes:

1. To understand the global perspective of nutrient requirements.
2. To learn how to critically evaluate the methodology and derivation of requirements for specific macronutrients.
3. Tolearnthemetabolicfunctionsofmacronutrientandtheirroleinhealthanddisease
4. Tounderstandtheimplicationsofdeficiencyandtoxicityofmacronutrientsandto assess their status in the body.
5. To stay updated with emerging concepts in macronutrient science.

UNIT-I : History of Nutrients 12L

Energy: Components of energy requirements: BMR, RMR, thermal effect of feeding, physical activity. Factors affecting energy requirements, methods of measuring energy expenditure, Regulation of energy metabolism and body weight: Control of food intake

UNIT-II :Carbohydrate 12L

Review of nutritional significance of carbohydrates and changing trends in dietary intake of different types of carbohydrates and their implications.

Fiber:

Types, sources, role and mechanism of action, Resistant starch, fructo- oligosaccharides, other oligosaccharides: Chemical composition and physiological significance, Glycemic Index and glycemic load , Carbohydrates and gene Expression

UNIT-III : Proteins: 12L

Overview of role of muscle, liver and G. I. tract in protein metabolism, Amino acid and peptide transporters, Therapeutic applications of specific amino acids, Peptides of physiological significance, Proteins, amino acids and gene Expression

Lipids:

Nutritionalsignificanceoffattyacids–SFA,MUFA,PUFA:functionsanddeficiency, Trans Fatty Acids, Conjugated linoleic acid, Nutritional Requirements and dietary guidelines (International &National) for visible and invisible fats in diets, Lipids and gene expression.

UNIT-IV **12L**

Vitamins: History,Sources,requirements,functions,deficiencydiseases.

Fat Soluble-A,D,E and K

Water soluble-Ascorbic Acid B complex

Minerals –Functions ,RDA, sources ,deficiency and excess effects - Macro Minerals and Micro Minerals. Trace Minerals –functions sources deficiency

UNIT-V: Water: **12L**

Sources, Functions, Distribution of body water ,Requirement, Maintenance of fluid and electrolyte balance, Water Balance, Mechanism of Loss, Regulation of water intake and output, distribution in water balance.

References:

1. MichaelJ.Gibney,HesterVVorsterandFransJKok(2003)IntroductiontoHuman Nutrition. Blackwell publishing Oxford, U.K.
2. Kathleen Mahan and Sylvia Escort –Stump (2000):Food, Nutrition& Diet Therapy11th Edition, W.B. Saunders Company London.
3. RoachBenyan(2003)MetabolismandNutritionElsevierScienceLtd.Philadelphia. U.S.A.
4. SusanG.Dudek(2007)NutritionEssentialsforNursingPractice,LippincotWilleamsd Wilkias, Philadelphea.
5. Z.S.C .Okoye :Biochemical Aspects of Nutrition ,Prentice-Hall of India Private Limited, New Delhi.
6. S.P. Singh: A Text Book of Biochemistry, Published by S.K.Jain, CBS publishers, New Delhi,
7. Shilo ,M.E. ,Olson J.A. and Shike ,M.(1994):Modem Nutrition In Health And Disease,8'h Edition, Philadelphia; Lea and Febiger (Vol. I &11).
8. W.H.O. (1996): Trace Elements in Human Nutrition and Health, WHO in collaboration with FAO and the International Atomic Energy Agency, Geneva.
9. Indian Council of Medical Research Nutrient Requirements and Recommended Dietary AllowancesforIndia,AReportoftheExpertGroupoftheIndianCouncilofMedical Research ,New Delhi ;ICMR.
10. Matab ,S .Bamji, N .Prahlad Rao,Vinodini Reddy(1996):Textbook of Human Nutrition, Oxford & IBM Publishing Co. Pvt. Ltd., New Delhi.
11. SwaminathanM.(1991):AdvancedTextBookonFood&Nutrition,Vol.I&11(2nd Edition, Revised), Bangalore printing & Publishing Ltd.
12. Chaney,M.S..-Rose,M.L.&WisehiJ.C.Nutrition(1979):HoughtonMifflim,Boston.
13. Official Methods of Analysis (2000) :Association of Analytical Chemists – Association of Official Agricultural Chemists, Washington D.C.

14. NationalInstituteofNutrition,(1983):ManualofLaboratoryTechniques.
15. Hawk P.B.,Oser B.L.and Summerson,(1972):W.H. Practical Physiological Chemistry, Ed. Bernard Oser, Tata McGraw Hill.

Food Science FSN-501-MJ

Credits-4 **TeachingHours-60**

Internal Marks -30 **External Marks-70**

Course Outcomes:

1. Understanding and in g of composition of various foodstuffs
2. To familiarize students with changes occurring in various food stuffs as a result of processing and cooking
3. Enablestudentstousethetheoreticalknowledgeinvariousapplicationsandfoodpreparations

UNIT-I: Introduction to Food Science. 12L

Effect of cooking and processing techniques on nutrients, Sensory evaluation of food.

Cereals ,Millets and Pulses

Composition and nutritive value, Cereal cookery, Effect of cooking, processing and storage in nutritive value. Methods for improving nutritional quality of foods-fermentation, germination, supplementation, fortification.

UNIT-II: Vegetables and Fruits- 12L

Type,Composition,Nutritivevalue,Effectofcooking,processingand storage on pigments and nutritive value, Post harvest changes.

Milk and milk products-

Nutritional composition, Properties ,Processing, Storage and Packaging. Effects of heat, acid and enzyme on its quality, Milk Cookery.

Sugar: Type ,Function and Nutritional composition of sugar. Sugar cookery.

UNIT-III: Egg- 18L

StructureandNutritionalcompositionofegg,Evaluationofeggquality,Eggcookery.

Flesh Food- Type, Structure and Nutritional composition, Effect of cooking, processing and storage in nutritive value. Ageing, Tenderization, Curing.

UNIT-IV: Fats and Oils- 12L

Type, Nutritive value and Function. Its role and importance

Beverages and Spices-Classification and Importance.

UNIT-V: Food toxins, Food Additives, Adulterants, Preservatives, Packaging. 06L

References:

1. Meyer L.J.(1989):Food Chemistry, CBS Publishers And Distributors, New Delhi.
2. LeeFrankA.(1975):BasicFoodChemistry.-WestpotConnectIcut:AVIPublishers.
3. SwaminathanA(1979):FoodScienceAndExperimentalFoods,GaneshAndCompanyMadras,
4. PeckhamG.andFreeiand-Graves,G.H.(1979):FoundationOfFoodPreparation,Mac Millin Company
5. Griswold, R.M.(1979):The Experimental Study of Food, Houghton Mifflim Boston.
6. Girdharilal ,G.S. Sidappa And G.L. Tandon (1986):Preservation Of Fruits And Vegetables,(2nd Ed), New Delhi: Indian Council Of Agricultural Research.
   SrilakshmiB.(2024):FoodScience,NewAgeInternational(P)Ltd.Publishers,WileyEasternLtd. , New Delhi.
7. Potter,N.andHotchkiss,J.H.(1996):FoodScience,Fifthed.,CBSPublishersand Distributors ,New Delhi.
8. CharleyM.JI982):Food Science(2nd Ed),John Wiley And Sons.
9. Belle Lowe(1963): Experimental Cookery, John Wiley And Sons Inc., New York
10. Paul P.C. and PalmerH.H.(1972): Food Theory And Application John Wiley And Sons, London
11. Bennion ,Marion And O .Hughes 1986):Introductory Foods ,Edi: macmillian N.Y.
12. Mahindru, S.N.: Food Additives, Characteristics, Detection And Estimation, Tata McGraw
    Hill Publishing Co. Ltd., New Delhi.
13. Acharya, K.T.: A historical Dictionary Of Indian Foods, Oxford Publishing Co.
14. Belitz ,H.D .and Grosch W.,(1999):Food Chemistry,(2nded),Springer, New York

Human Physiology FSN-503-MJ

Credits-2 **TeachingHours-30**

Internal Marks -15 **External Marks-35**

Course Outcomes:

1. Toenablethestudentstounderstandthefunctionsofvarioussystemsinthebody.
2. To acquaint the students with abnormalities of endocrine system.

UNIT-I: Cell and Tissue: **05L**

Structure and function of cell, Cell membrane, Formation of tissue, organ and system

Musculoskeletalsystem: Typesofmuscle(Skeletal,smoothandcardiacmuscles)their properties,

Characteristics ,structure and function. 05L

UNIT-II: Nervous system:

Types Structure and function of brain, spinal cord, neuron

Endocrinesystem: Endocrineglands-structure,function,roleofhormones,regulationof hormonal Secretion

UNIT-III: Digestive system : **10L**

and function of digestive system, Salivary gland and it's secretion, stomach it's section, pancreas, bile, small intestine, large intestine

Excretory system :

Structure and functions of kidney ,Urine formation Role of kidney in maintaining pH of blood , Water, electrolyte and acid base balance

UNIT-IV: Respiratory system : **05L**

Review of structure and function. Role of lungs in the exchange of gases, Transport of oxygen and carbon dioxide

Circulatory system:

Structure and function of heart, Regulation of cardiac output and blood pressure

UNIT-V: Blood: **10L**

Formulation, function and composition of blood, Blood clotting, hemoglobin synthesis,

Immune system: Natural immune system, components of immune mechanism, production of antibodies

References:

1. Ganong.W.F.(1985):ReviewofMedicalPhysiology,12th Edition,LangeMedical Publication.
2. MoranCampellE.J.,Dickinson,C.J.,Slater,J.D.,Edwards,C.R.W.andSikora, K.(1984): Clinical Physiology,5thEdition,ELBS,BlackwellScientific Publications.
3. Guyton. A.C.(1985):Function of the Human Body, 4th Edition, B. Sanders Company, Philadelphia.
4. Guyton.A.C.andHall.J.B.(1996):TextbookofMedicalPhysiology,9th Edition.W.B. Sanders Company. Prisrr Books (Pvt.) Ltd. Bangalore.
5. Wilsion. K.J.W. and Waugh. A (1996):Ross and Wilson Anatomy and Physiology in Health and illness. 8thEdition.Churchill Livingstone.
6. Jain.A.K.TextbookofPhysiology.VolIandII.AvichalPublishingCo.NewDelhi8

Practical I FSN-MJP-554

Credits-4 **TeachingHours-120**

Internal Marks -30 **External Marks-70**

Practical's:

1.Estimation of body composition using different methods– 2P

1. Body Composition Analyzer
2. Skin Fold measurement

2. Calculation of Energy requirements **2P**

To calculate BMR using different formulas

To calculate energy expenditure based on physical activities using different methods

3.Evaluation of protein quality of dishes **4P**

To calculate chemical score &Net Dietary Protein Calorie Percent [NDP Cal%] of dishes

4. Sensory evaluation of the given sample using descriptive method. 5P

Sensory evaluation of given sample with the help of 'Duotrio test' and prepare Evaluation card for the same.

Sensory evaluation of given samples using Triangle Test and prepare an evaluation card for the same 4P

demonstrate the process of sugar re crystallization through the preparation of fondant, and fudge. 4P

5.To determine the best method of preparing as table emulsion like mayonnaise 4P.

6.Preparation of fruit jam and fruit jelly. 2P

7.To study and detect various adulterants in foodstuffs 3P

Semester I

Major Elective Courses (FSN-510-OE to FSN-513-OEP)

Food Service Management FSN-510-OE

Credits-2 **Teaching Hours-30**

Internal Marks -30 **External Marks-70**

Course Outcomes:

1. Develop acknowledge base in key areas of Food service management
2. Gain knowledge in theories and principles of management.
3. Understand the management of human and marketing.

UNIT-I: Development ,Scope and Types of Food Service Establishments 6L

History, scope and development of food service institutions, factors affecting development, recent trends, Types of food service establishments (commercial and non-commercial) and their characteristic features. Planning for a food service Unit - Planning, Investment, Project Report, Registration (License and Inspection)

Food Service Organization and Management

Types of Organization, Division of Labour, Organization Chart, Tools of Organization, Principles of Management, Functions of Management (Planning, Organizing, Directing, Coordinating, Evaluating Controlling,) Total Quality Management (TQM), Management by Objectives (MBO), Work Design, Job Design, Work Study and Simplification

UNIT-II: Quantity Food Preparation 6L

Methods of purchase (formal and informal),Identifying needs ,Selection, Receiving, Storage types, Issuing

a. **Menu Planning-**Importance, Functions of Menu, Types, Steps in Menu Planning, Designing
b. **Quantity food preparation-**food production systems management, Production control Standardization of recipes, Stepping up of recipes, portion control, Quality control in food preparation.

UNIT-III: Quantity food service 6L

FoodServiceDeliverySystems(CentralizedandDecentralized)Typeoffoodservicesystems (conventional, commissary, ready prepared, assembly), Service Styles(table, counter, tray, silver, plated, cafeteria, buffet), Specialized forms of service(hospital, airline, rail, home delivery, catering and banquet, room and lounge service). Table Setting

UNIT-IV: Organization of Space and Equipment **6L**

Design and layout of kitchen, Types of kitchens, storage and service areas, Planning space and layout of work Centers. Equipments – types, planning, Factors affecting selection and purchase

UNIT-V: Financial Management **6L**

Book keeping (Single and Double entry system), Books of Accounts, Journal, ledger, trial balance, balance sheet, Type and Behavior of costs, profit analysis, Records and Controls, Budget, Food cost control methods Personnel Management and Sanitation and Safety in food service industry

References:

1. DennisL. Foster(1995),'An Introduction to Hospitality',Mc Graw Hill International Edition.
2. Dennis, R. Lillicrap, John, A. Cousins (1993), "Food and Beverage Service', Older and Stoughten Publishers Ltd, England, IV Edition.
3. Jack D. Ninemeier (1995), 'Foodand Beverage Management', 2nd Edition, American Hotel and Motel Association, U.S.A.
4. Lendal H. Kotschevar and Richard Donnely (1993)'Quantity Food Purchasing, McMilan
5. Publishing Co., New York ,IV Edition.
6. Mahmood A.Khan,(1987),'Food Service Operations', AVI, U.S.A.
7. MarianC.Spears(1995),FoodServiceOrganisation',IIIrdEdition,PrenticeHallInc., USA
8. MohiniSethiandSurjeetSinghMalhan(1993),'CateringManagement-AnIntegrated
9. Approach',2ndEdition,WileyPublication,Mumbai.
10. SudhirAndrews(1997),'FoodandBeverageService-TrainingManual',23rdReprint, Tata McGraw Hill Publishing Co.
11. West, B Bessie and Wood, Levelle (1988), 'Food Service In Institutions', 6th Edition, Macmillian Publishing C., New York

Food Service Management FSN-511-OEP

Credits -2 **Teaching Hours -60**

Internal Marks -15 **External Marks-35**

Practicals:

1. Standardization of recipes. 2P
2. Planning, preparation and modification in basic recipes. 2P
3. Quantity food production and cost calculations. 4P
4. Preparation of menu cards of various types. 1P
5. Menu planning and table setting. 2P
6. Maintenance of account and recordkeeping.
7. Visit to different types of food service, institutions and study the following:1P
8. Organization, physical plan and layout, menu cards, serving style, table setting, personnel work schedule, hygiene and sanitation, safety measures .Practical experience in organization and management of a college cafeteria/ hostel/ hotels. Record keeping and cost calculation. 1P
9. Planning and preparations for special occasions birthday, festivals, packed lunches.1 2P

Nutrition Exercise and Fitness FSN-512-OE

Credits -2 Teaching Hours -30

Internal Marks -15 External Mark-35

Course Outcomes:

1. Understandtherelationshipsbetweenphysicalactivity,fitnessandhealth
2. Acquire knowledge about the different components of physical fitness.
3. Develop skill in prescribing exercise.
4. Understand the relation between nutrition and physical activity.

UNIT-I: Concept of wellness **5L**

1. Dimensionsofwellness–physical,emotional,intellectual,spiritualandsocialhealth
2. Roleofotherfactorsinwellness.
3. Componentsofhealth-relatedphysicalfitness–cardiorespiratoryendurance, muscular strength, muscular endurance flexibility, body composition
4. Skill related components of fitness–speed ,power, agility ,balance

UNIT-II: Principles of physical training **5L**

1. Specificity,progressiveoverload,reversibility,individualdifferences,FITTprinciple
2. Developing exercise programme, worm up and cool down Cardiorespiratory Endurance
3. Review of cardiovascular system
4. Exercise and3energy system
5. Benefits of Cardiorespiratory endurance exercise
6. Assessing cardiorespiratory fitness–ergometry,steptest,onemilewalk,12min walk, 1.5-mile walk Monitoring heartrate
7. Developing a cardiorespiratory endurance programme

UNIT-III: Muscular strength and Endurance **5L**

LBenefits of muscular strength and endurance

1. Static and Dynamic exercise, Concentric and eccentric contraction
2. Applying FITT principle for developing weight training programme
3. Weight training safety
4. Assessment of muscular strength and endurance handgripdynamometer1RMsitup,

UNIT-IV: Flexibility 5L

1. Concept of flexibility Benefits of flexibility
2. Assessment of flexibility seat and reach, trunk flexibility neural function
3. Body composition

a. Importance of body composition
b. Components of body composition

4. **Assessment of body composition**–skinfold measurements, BIA,DEXA–
   a. Indices–BMI,W/H ratio, broka's index

UNIT-V: Exercise guidelines for life stages– 5L

1. Children,adolescents,pregnantwomen,geriatricpopulationhowoftenshouldtheydo outdoor games, which they should include, avoid.
2. Exercise guidelines for people with special health concerns–obesity, underweight, arthritis, osteoporosis, diabetes, heart disease

UNIT-VI: Prevention and Rehabilitation of exercise related injuries 3L

1. Causes and prevention – backache, delayed onset muscle soreness, muscle strain tendonitis, ligament sprain, torn cartilage, shin splits, stress fractures Exercise, fluid balance and rehydration
2. Thermo regulation during exercise
3. Rehydration, sports drinks Ergogenic aids

UNIT-VII: Stress Management 2L

1. Stress, physical, emotional and behavioral responses to stress
2. Managing stress through exercise and relaxation techniques

References:

1. Anita B (1998),The Complete Guide to Sports Nutrition, ASC Black, London.
2. Catherine G.R.J.–Nutrition and strength Athlete.
3. Clork N.–Sports Nutrition, Guide book, Leisure Press Campaign.
4. Inge Kand Robert C– Food for Sport Cook Book
5. Mc. Ardle, William D–Exercise Physiology, Energy, Nutril and Human Performance
6. Robergs R.A. and Roberts S.O.(2000)Fundamental principles of exercise physiology for fitness, performance and health, Mcgraw Hill
7. SandhuG.S.andMannN.S.(2000)–SportsExcellenceaPsychologicalPursuit, Friends Publication (India).
8. WolinskyI.(1998),NutritioninExerciseandSport,3rd ed.CRC Press.
9. AlexandriaV.(1981):Exercising for Fitness, Time Life Books.
10. Briggs G.M. (1984) – Nutrition and Physical Fitness, Rinchart and Winston Inc New York.
11. SmolinL.A.(1994)–Nutrition–Science and Applications, M.B. Fort Worth, Saunders College Publishing.

12. Davidson S. (1986) – Human Nutrition and Dietetics–Edinburgh, ELBS/Churchill Livingstone.
13. McArdle,WilliamD,Katch,FrankI,Katch,VictorL.,(2007)ExercisePhysiology,6th ed.
14. Kansal, Devinder K(1996), Test and Measurement in Sports and Physical Education, DVS Publication.
15. Sharkley, BrianJ,(2002),FitnessandHealthHumanKinetics,5th ed.

Nutrition Exercise and Fitness FSN-513-OEP

Credits -2 **Teaching Hours -60**

Internal Marks -15 **External Mark-35**

Course Outcomes:

1. Develop skills and techniques of assessing physical fitness.
2. Have knowledge about exercises for improving physical fitness.
3. Plan and prepare diets for physically active Person

Practicals:

1. Assessment of body composition 4P

1. Need for measuring body structure and composition
2. Somatotypingclassification,height–weighttables,skinfoldtests,Bodymassindex,Fat distribution – W/H ratio Assessment of flexibility
3. Need for measuring flexibility
4. Test for flexibility–(i)Sit and reach,(ii)Trunkex tension

2-Assessmentofmuscularstrengthandendurance 4P

1. Need for measuring muscular ,Strength and endurance
2. Situptest
3. Pushups
4. Pullups
5. Dynamometer Assessment of aerobic fitness
6. 1milerun/1milewalk
7. 12min.and9 min run
8. Demonstration of exercise to develop
9. Flexibility
10. Endurance
11. Strength
12. Cardiorespiratory fitness

3.Designing an exercise prescription for adult population 4P

1. Cardiac-1,3,5
2. Strength–2,4,6orcombinationofboth
3. Warmup–actual exercise–cool down

4.:Planningandpreparing 3P

1. Prevent meal
2. Post event meal

3. Sports drink.
4. Antioxidant rich dishes
5. Planning and preparing meals for
6. Aerobic sports
7. Anaerobic sports
8. Aerobic and strength training sport
9. Visit to a gym

References:

1. Anita B(1998), The Complete Guide to Sports Nutrition, ASC Black, London.
2. Catherine G.R.J.–Nutrition and strength Athlete.
3. Clork N.–Sports Nutrition, Guide book, Leisure Press Campaign.
4. Inge Kand Robert C– Food for Sport Cook Book.
5. Mc.Ardle,WilliamD–ExercisePhysiology,Energy,NutrilandHumanPerformance.
6. Robergs R.A. and Roberts S.O.(2000)Fundamental principles of exercise physiology for fitness, performance and health, Mcgraw Hill.
7. SandhuG.S.andMannN.S.(2000)–SportsExcellenceaPsychologicalPursuit, Friends Publication (India).
8. Wolinsky I.(1998),NutritioninExerciseandSport,3rd ed.CRC Press.
9. Alexandria V.(1981):Exercising for Fitness, Time Life Books.
10. Briggs G.M. (1984) – Nutrition and Physical Fitness, Rinchart and Winston Inc New York.
11. SmolinL. A.(1994)–Nutrition–Science and Applications, M.B. Fort Worth, Saunders College Publishing.
12. Davidson S. (1986) – Human Nutrition and Dietetics–Edinburgh, ELBS/Churchill Livingstone.
13. McArdle,WilliamD,Katch,FrankI,Katch,VictorL.,(2007)ExercisePhysiology,6th ed.
14. Kansal, Devinder K(1996), Test and Measurement in Sports and Physical Education, DVS Publication.
15. Sharkley,BrianJ,(2002),FitnessandHealthHumanKinetics,5th ed.

Research Methodology FSN-531-RM

Credits -4 **Teaching Hours - 60**

Internal Marks -30 **External Marks -70**

Course Outcomes:

1. Develop a scientific approach and know the processes of research
2. Developthecompetenceforselectingmethodsandtoolsappropriateforresearch topics
3. Understandconceptsofstatisticalmeasuresofcentraltendency,dispersion,variability and probability

UNIT-I **12L**

1. **Introduction to Research:** What is research? Need of research; Problem solving and scientific method; Terminologies used in research; Scope of research – areas, types and problems; Elements and ethics in research.
2. **Research Approaches:** Types–Qualitative and Quantitative; Historical, Descriptive, Experimental, Surveys, Participative; **Research Designs :**Research process – steps, concepts and constructs; Research problems and statements; Review of literature; Definition of terms; Assumptions, Limitations
3. **Research Hypothesis**: hypothesis; types of hypothesis types of errors; methods to control errors.
4. **Sampling:** Population and sample; Factors influencing sampling; Characteristics of a good sampling design; sample size; sampling technique; Problems of sampling.

UNIT-II **12L**

1. **Tools and method of data collection :**Methods of data collection- quantitative, qualitative; Tools for data collection and their development; Validity and reliability of tools; Feasibility of study; Conduct of research.
2. **Analysis and Interpretation of data :**Qualitative and quantitative analysis; Interpretation of data; Conclusion and generalizations; Summary and discussion
3. **Reporting and utilizing results:** Communication of research results; Writing research report, methods and style;
4. Writing style for scientific article for publication.

UNIT-III **12L**

1. **Introduction to Statistics :**Basic concepts related to statistics ;Significance and scope of statistics; Levels of measurement
2. **Organization and Presentation of data:** Classification and tabulation of the data; Diagrammatic and Graphical representation of the data

UNIT-IV **12L**

Statistical Method and Applications

1. **Descriptive Statistics:** Measure of Central tendency – Mean, Median, Partition values,Mode;Measuresofvariability–Range,Quartiledeviation,Meandeviation, Standard deviation
2. **MeasuresofRelationship:**Correlation–needandmeaning;scatterdiagrammethod, Karl Pearson's coefficient of correlation, Rank order correlation; Simple linear regression analysis
3. **Theoretical Frequency distributions:** Need and meaning; Probability; Binomial distribution; Poisson distribution; Normal distribution tabulation of the data; Diagrammatic and Graphical representation of the data

UNIT-V **12L**

1. **TestingofHypothesis:Parametric**tests-t-test,ANOVA;Chi-squaretest-testof independent,goodnesssoffit;non-Parametrictests–Signtest,Mediantest,Mann Whitney U test.
2. **UseofComputersindataanalysis:Data**compilation,datamanagement,useof statistical packages

References:

1. Kothari,C.R.(2000):Research Methodology: Methods and Technique Wisha Prakashan, New Delhi.
2. Kumar,A.(1997):SocialResearchMethod(TheArtofScientificInvestigation), Anmol Publication, New Delhi.
3. Kumar,A.(2002):Research Methodology in Social Sciences, Sarup and Sons, New Delhi. McBurney, D.H. (2001): Research Methodology, Thomson- Wadsworth, Australia.
4. Pande,G.C. (1999): Research Methodology in Social Sciences, Anmol Publication, New Wayne Goddard and Stuart Melville, "Research Methodology:AnIntroduction"
5. RanjitKumar,2nd Edition,"ResearchMethodology:AStepbyStepGuideforb

Semester II: Major Core Courses

(FSN-551-MJT to FSN-554-MJP)

Nutrition Through Life Cycle FSN-551-MJT

Credit – 04 **Teaching Hours – 60**

Internal Marks -30 **External Marks-70**

Course Outcomes:

1. Enable the students to know physiological changes and nutritional requirements during various stages of life cycle.
2. Understand the importance of nutrition and health.
3. Comprehend the basic aspects of meal planning.
4. Obtain knowledge on the nutritional needs pertaining to different stages of life.
5. Plan diet for various age groups.

UNIT-I : **Nutrition in Infant** **6L**

Growth and development of infants

Infants- weight as the indicator , Feeding premature infants and low birth weight infants, breastfeeding versus bottle feeding

Nutrition requirements for infants

Supplementary feeding and weaning foods

UNIT-II: Nutrition in Preschool and School **12L**

Nutrition in preschool children

Growth and development of preschool children

Food habits of preschool children

Nutritional requirements and supplementary foods for preschool children

Nutritional problems and feeding programmes

Nutrition in early and middle childhood

Growth and development of childhood, Food habits nutritional needs and feeding and pack lunch for children

UNIT-III: Nutrition in adolescence **6L**

Growth and development

Physiological and Psychological changes, Nutritional requirements of adolescents

Health and eating related behavior

UNIT- IV: Nutrition situation with special needs **12L**

Pregnancy Eating disorders, breast milk composition, formula feeding, low birth weight infant

Obesity–underweight

Substance abuse Deficiency conditions

Sports and athletics Nutrition in lactation - Physiology of milk production, Hormone controls and reflex action, Nutrition requirements during lactation, Nutritional components of colostrum and mature milk, Problems of breastfeeding, Galactoguages

UNIT-V: Nutrition in the adult years **12L**

Physiological and Psychosocial changes Common nutritional concerns.

Nutritional requirements and dietary recommendation.

Physical Activity in adulthood

Low cost balanced diet, Dietary guidelines to reduce the cost of meal

Reference man and woman

UNIT-VI: Nutrition in Elderly **12L**

Theories of Aging, Physiological and Psychosocial changes

The Aging Process

Nutritional requirements of the Elderly Nutrition care.

References :

1.Mahtab, S., Bamji, Krishnasamy, K., Brahmam, G.N.V., (2012) Text Book of Human Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi.

2.Srilakshmi,B.,(2013),Dietetics,NewAgeInternational(P)Ltd.,NewDelhi.

3. Swaminathan, M., (2012), Advanced Textbook on Food and Nutrition, Vol. 1,Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore.

4. Shubhangini, A., Joshi (2002): Nutrition and Dietetics, 2nd edition, TataMcGraw- Hill Publishing Company Limited, New Delhi.

5. Krishnasamy, K.andSesikeran,B.,(2013),Dietary Guidelines for Indians, National Institute of Nutrition, ICMR, Hyderabad.

6. Gopalan, C.Rama Sastri,B.V. and Balasubramanian, (2014), Nutritive Value of Indian Foods, NIN, ICMR, Hyderabad.

7. Longvah, T., Ananthan, R., Baskarachary, K. and Venkaiah, K., (2017), Indian Food Composition Table, NIN, ICMR, Hyderabad.

8. Krause, M.V. and Hunscher, M.A., (2000)Food, Nutritionand Diet Therapy, 14th Edition, W.B. Saunders, London.

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10. Wardlaw, G.M., Hampi, J.S., DiSilvestro, R.A., (2004), Perspectives in Nutrition,6thedition, McGraw Hill, NewYork.

11. Chadha,R. and Mathur, P., (2015), Nutrition: A Lifecycle Approach, Orient Blackswan, New Delhi.

12. Anderson L, Dibble MV, Turkki PR, Mitchell HS &Rynbergen HJ. 1982. Nutrition in Health and Disease. JB Lippincott Co.

13.Beal VA. 1980. Nutrition in the Life Span. John Wiley & Sons.
14. Falkner F & Tanner JM. 1978. Human Growth.VolS. I-III. Plenum Press.
15. FAO/WHO/UNU. 1985. Energy and Protein Requirement. Tech. Report 724. WHO.
16. Ghosh S. 1988. The Feeding and Care of Infant and Young Children.Voluntary Health Association of India, New Delhi.
17.Guthrie HA. 1989. Introductory Nutrition.Times Mirror/Mosby College Publ.
18. ICMR. 1990. Nutrient Requirement and Recommended Dietary Allowance for Indians. A Report of Expert Group of the ICMR, NIN, Hyderabad.
19. Khetarpaul N, KatyalSudhaK & GroverI. 2001 Infant Health and Nutrition.Agro Tech. Publ. Academy.
20. Robinson CH & Lawler MR. 1986.Normal and Therapeutic Nutrition, McMillan.
21. Williams SR, Worthington RS, Sneholinka ED, Pipes P, Ress JM &Mahal KL. 1988.
22. Introduction Nutrition throughout the Life Cycle. Times Mirroe/Mosby College Publ.

Therapeutic Nutrition- FSN-552-MJT

Credit -04 **Teaching Hours -60**

Internal Marks -30 **External Marks-70**

Course Outcomes:

1.Obtain knowledge on the role of diet in various disease conditions.

2. Students are able to understand Principles of Diet therapy, modifications of normal diet for therapeutic purposes, and Role of a Dietitian.

UNIT- I :Diet therapy, nutritional care in energy imbalance and surgery 15L

Introduction to dietetics:

Principles of Diet Therapy, Therapeutic modification of normal diets, Types of Hospital Diets-Clear-fluid, full fluid and soft diet, Special Feeding Methods-Enteral and Parenteral Nutrition.

Energy imbalance obesity :

definition, types, aetiology, assessment, complications, Management of Obesity- Exercise, Diet, Behaviour modification,

Underweight :

Aetiology, Complications, Dietary Modifications

UNIT- II : Nutritional care in gastro intestinal disease, Diabetes and febrile condition 15L

Gastro intestinal disturbance:

Aetiology ,Symptoms, Diagnosis, Treatment

and dietary of Peptic Ulcer, Diarrhea, Constipation,

Diabetes mellitus Types, Aetiology, Symptoms, Diagnosis, Complications, Treatment– Exercise, Hypoglycemic drugs, Insulin and Diet, Dietary Management-Glycemic Index and Food Exchange List

Febrile condition– Metabolic changes in Fever, Types- Short Duration-Typhoid, Intermittent Duration-Malaria, Long Duration- Tuberculosis, Dietary Management.

UNIT- III: Nutritional care in cardio vascular disease and liver disease 15L

Cardio vascular disease : Atherosclerosis-Relationship between dietary fat and development of cardiovascular diseases ,Risk Factors and Dietary Management .Hypertension- Types, Causes, Symptoms and dietary management of Hypertension.

Liver disorder :

Functions of Liver, Liver function tests, agents responsible for liver damage,Jaundice, Non-alcoholic fatty liver disease (NAFLD), Hepatitis.

Cirrhosis and hepatic coma :

Causes, symptoms, Dietary management.

UNIT-IV: Nutritional care in renal disorder and cancer 15L

Neohrosis and nephritis – Functions of kidneys, Causes, symptoms, Dietary management.

Renal failure and renal calculi - Causes, types and Dietary management. Dialysis-Types and Dietary Treatment

Cancer - Definition, Aetiology, Symptoms, Therapies, Dietary Management ,Role of Functional Foods in Prevention of Cancer.

References:

1. A Comprehensive Textbook Of Nutrition & Therapeutic Diets For Bsc & Post Basic Students , by Darshan Sohi (Author)
2. Nutrition and Diagnosis-Related Care - With Access, by Sylvia Escott-Stump
3. Robinson's Basic Nutrition and Diet Therapy - Eighth Edition
4. Basic Nutrition and Diet Therapy by Sue Rodwell Williams (Author)
5. Normal and Therapeutic Nutrition Paper by Corinne Hogden Robinson (Author), Marilyn Lawler (Author)
6. Nutrition And Diet Therapy by Carroll A. Lutz, Karen Rutherford Przytulski, F.A. Davis Company.
7. Krauses Food And Nutrition Care Process 14Th Edition by L Kathleen Mahan and Janice L Raymond, Elsevier Science.
8. Understanding Normal and Clinical Nutrition - 11th edition, by Sharon Rady Rolfes, Kathryn Pinna and Ellie Whitney

Nutritional Biochemistry FSN-553-MJ

Credits -2 **Teaching Hours -30**

Internal Marks -15 **External Marks-35**

Course Outcomes:

1. Describe structure ,functions and metabolism of macronutrients.
2. Describe hormonal and enzymatic modulators to the metabolism of macronutrients.
3. Describe the biochemistry and metabolism of the macronutrients during different physiological states.
4. Listimportantmicronutrientsneededascofactorsinvolvedinmacronutrient metabolism.
5. Explainthemetabolicinterrelationshipbetweenmacronutrients.Haveknowledgeof current research on nutrition and metabolism

UNIT-I: **6L**

Metabolism: Introduction, Definition, objectives, scope and inter relationship between Biochemistry and nutrition. Introduction, Classification and Nutritional importance of nutrients-Carbohydrate, Protein and Lipids Digestion, Absorption of different nutrients in the human System

UNIT-II: **6L**

Carbohydrate Metabolism: Glycolysis, TCA cycle, Glycogenesis, Glycogenolysis, Gluconeogenesis.

UNIT-III: **6L**

Protein Metabolism: Transamination, Deamination, Urea cycle, Creatine & creatinine synthesis

UNIT-IV: **6L**

LipidMetabolism**:**Beta-oxidation,Ketonebodyformation,Lipoproteins–types and metabolism.

Enzymes: Classification, intracellular distribution of enzymes. Enzymes in clinical diagnosis(ALT,AST, Alkaline Phosphatase

UNIT-V: **6L**

Classification, hormonal control on Carbohydrate, protein & lipid metabolism.

a. Pancreas: Insulin and Glucagon, Thyroid:T3, T4, Parathyroid,calcitonin

b. Medulla-epinephrine & norepinephrine Cortex: Glucocorticoids& mineralocorticoids

References:

1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W.(2000):25th Ed. Harpers Biochemistry. Macmillan Worth Publishers.
2. Nelson,D.L.andCox,M.M.(2000):3rdEd.Lehninger'sPrinciplesofBiochemistry, Macmillan Worth Publishers.
3. Devlin,T.M.(1997):4thEd.TextbookofBiochemistrywithClinicalCorrelations,WileyLiss Inc
4. Stryer, L.(1998):4thEd.Biochemistry,WHFreemanandCo.
5. Conn,E.E.,Stumpf,P.K.,Bruening,G.andDoi,R.H.(2001):5th Ed.Outlinesof Biochemistry, John Wiley and Sons.
6. Voet, D.Voet, J.G.and Pratt, C.W.(1999).Fundamentals of Biochemistry.
7. Tietz, N.W.(1976) Fundamentals of Clinical Chemistry. WB Saunders Co.
8. King, E.J. and Wootton, I.D.P.(1956).3rded.Micro-AnalysisinMedical Biochemistry. J and A Churchill Ltd.
9. Plummer,D.T.(1987).3rded.AnIntroductiontoPracticalBiochemistry.McGraw-HillBook Co

Practical II FSN-554-MJP

Credits-4 Teaching Hours-120

Internal Marks -30 External Marks-70

Practicals:

1 .Diet plan for an adult man and woman–Sedentary, moderate & heavy activity. 2P

2. Diet planning for pregnant woman, lactating woman, preschool ,school age, adolescent old age patient. 2P

3. Recipes for weaning foods. 2P

4.Planning and preparation of diets Fiber and Residue.2P

5.Planning and preparation of diets In Diarrhea 2P

6.Planning and preparation of diets For Peptic Ulcer 2P

7.Planning and preparation of diets For Liver diseases. 2P

8.Planning and preparation of diets For Obesity 2P

9.Planning and preparation of diets For fevers and infections 2P

10.Planning and preparation of diets For Insulin and non-insulin dependent diabetes.2P

11.Planning and preparation of diets For cardiovascular diseases.2P

12.Planning and preparation of diets For kidney diseases 2P.

13. Biochemical Analysis–Estimation of Hemoglobin 2P

14. Qualitative Estimation of Carbohydrates: Identification of glucose, maltose, fructose, estimation of blood 2P

15. Urine analysis for urea, glucose, protein 2P

Semester II

Major Elective Courses (FSN-560-OE to FSN-563-OEP)

Food Microbiology FSN-560-OE

Credits-2 **TeachingHours-30**

Internal Marks -15 **External Marks-35**

Course Outcomes:

1. Gain deeper knowledge of microorganism in human environment and understand the importance of microorganism in food technology
2. Develop skills in handling food safety
3. Know the food born disease and how to prevent this

Course Contents

UNIT-I **6L**

Food Microbiology-Introduction, Definition ,Overview

Importance of Food Microbiology

Factors affecting growth of Micro-organisms-intrinsic and extrinsic factors like pH, water activity, oxidation reduction potential, nutritional requirements, temperature, relative humidity, gaseous environment, biological structure of food and inhibitory substances

UNIT-II **6L**

Methods of isolation or detection of micro-organisms or their products in food Conventional methods Rapid method(Newer techniques)

Immunologicalmethods-Fluorescent,Antibody,Radio-immunoassay,ELISA etc.

Chemical methods-Thermos table, Nuclear, ATP measurement ,PCR(Polymer Chain Reactions)- only principles in brief

UNIT-III **6L**

Sources of contamination of food- water, air soil, sewage, animals, during handling and processing

General principles underlying spoilage

Chemical changes due to microbial spoilage

Spoilage of different groups of food- cereal and cereal products ,vegetables and fruits, meat and meat

Products ,egg and poultry, fish and other sea foods, sugar, milk and milk products, canned foods.

UNIT-IV **6L**

Role of microbes in fermented food and genetically modified foods, malt, bread, beverages,vinegar,fermentedvegetables,fermenteddairyproducts,teaandcoffee. Single cell protein, fats, amino acids, and enzymes from micro-organisms. Foodpreservation-Physicalmethods.Chemicalpreservativesandnaturalanti-microbial compounds. Food borne diseases-infections and intoxications .Bacterial and viral food borne disorders. Mycotoxins.

UNIT-V **6L**

Foodsanitation-Microbiologyinfoodplantsanitation,bacteriologyofwater,sewage and waste treatment and disposal.
Indicatorsoffoodsafetyandquality-microbiologicalcriteriaoffoodandtheir significance HACCP system and food safety used in controlling microbiological hazards .Food control and enforcement agencies. Microbiological standards

References:

1. Foster, W.M.(2020). Food Microbiology, C.B.S Publishers Pvt Ltd.
2. Ananthanarayanan, R., &Paniker.(2013). Text Book of Microbiology, 9th Edition, Orient Blackswan Publishers Pvt Ltd.
3. Virendra, K.P.(2021). Text Book of Food Microbiology, INSC International Publishers.
4. Martin, R. Adams., Mauric, O, M., Peter, M.(2015). Food Microbiology, 4th Edition, Royal Society of Chemistry.
5. Vasanthakumari.(2016). Text book of Microbiology, Wolters Kluwer (India) Pvt Ltd, 3rd Edition.
6. William, C.F, Dennis, C.,Westhoff, N.M.,Vanitha. (2017). Food Microbiology, McGraw Hill Education; 5th Edition.
7. Mahendra, R.,& Pal, M.(2015). Sanitation in Food Establishments. LAP Lambert Academic Publishing.
8. Sequeira, K.K., Kapoor, K.S., Yadav., Tauro. P.(2019). An Introduction to Microbiology, New Age International Publishers, 3rd Edition.
9. Sharad, V. (2015). A laboratory Text book of Biochemistry, Molecular Biology and Microbiology, Grin Publishing.
10. Connie, R., Mahon, D.C., Lehman. (2018). Textbook of Diagnostic Microbiology, Saunders Publishers.

Web Resources:

http://nuristianah.lecture.ub.ac.id/files/2014/09/fundamental-food-microbiology.pdf

https://www.firstnations.org/wp-content/uploads/2018/11/Introduction-to-Food-Microbiology-A.pdf

https://www.ihmnotes.in/assets/Docs/Sem-3&4/FOOD%20SAFETY%20&%20QUALITY/3.pdf

Food Microbiology FSN-561-OEP

Credits -2 Teaching Hours -60

Internal Marks -15 External Marks-35

Practicals:

1.Preparation of common lab media and special media for cultivation of bacteria, yeasts and moulds 3P

2.Staining and identification of bacteria (gram staining, acid-fast, spore, capsule), yeasts and molds 2P

3.Cultivationandidentificationofimportancemoldandyeasts(slidesandmoundculture)2P

4.Isolation of micro-organisms 2P

5.Bacteriological analysis of processed and unprocessed foods5P

6.Bacteriological analysis of water and milk 1P

Public Health Nutrition FSN-562-OE

Credits -2 Teaching Hours -30

Internal Marks -15 External Marks-35

Course Outcomes:

1. Develop holistic knowledge and understanding public nutrition concept
2. Understand the food situation and determination of nutritional status
3. Familiar with various approaches to nutrition and health intervention programmes and policies

UNIT- I: Food and Nutrition Situation in India 4L

Food and Nutrition security, Production and availability of foods in India, Trends in dietary intake and nutritional status of Indian population, Dual burden of malnutrition.

UNIT- II: Principles of Epidemiology 4L

Introduction to Epidemiology ,epidemiological study methods, Nutrition Epidemiology and Public Health Nutrition.

UNIT-III: Assessment of nutritional status in community setting 6L

Nutritional assessment, Importance and Objectives. Direct assessment of nutritional status – Techniques, interpretation and applications of Anthropometry, Z scores, Clinical assessment,

Biochemical assessment, Dietary assessment methods Indirect assessment of Nutritional status

Age specific mortality rates, cause specific mortality rates ,nutritionally relevant morbidity rates, ecological factors.

UNIT-IV: Epidemiology of Nutritional disorders 4L

Prevalence,Clinicalsigns,Classification,AetiologiaPreventionandControlof–

1. Protein Energy Malnutrition
2. Vitamin A Deficiency
3. Anemia
4. Iodine Deficiency Disorders
5. Zinc Deficiency
6. Fluorosis

UNIT-V: Nutrition Education 4L

Definition,Significance,PlanningandImplementationofNutritionandHealthEducation Programme.

UNIT-VI: Nutrition related Non-Communicable Disorders 4L

Changing trends in lifestyle .Nutrition transition. Risk factors for diet related NCDs-

Coronary Heart Diseases, Obesity, Diabetes mellitus, Metabolic Syndrome, Cancer

UNIT-VII: 4L

Organizations and programs in the field of nutrition monitoring and Interventions

WHO,FAO, UNICEF,CARE,NFHS,NNMB,ICDS,NRHM,ICMR,ICAR.

References:

1. Maurice B Shils, Moshe Shike. A, Catherine Ross, Benjamin Cabellero, Robert J Cousins. 2006. Modern Nutrition in Health and Disease edited by, Lippincott Williams and Wilkins.
2. Nutrient Requirements and Recommended Dietary allowances for Indians. A report of the expert group of the Indian Council of Medical Research ICMR 2010.
3. Sheila ChanderVir.2011. Public Health Nutrition in Developing Countries Edited by Wood head Publishing India, Part I & II.

Public Health Nutrition FSN-563-OEP

Credits -2 Teaching Hours -60

Internal Marks -15 External Marks-35

Practicals:

1. Techniques of nutritional assessment 4P

1. Anthropometry–Height, weight, MUAC, BMI, WHR
2. Dietsurvey-3dayweighmentand24hourrecall
3. Clinical assessment
4. Biochemical Assessment

2. Techniques of growth monitoring 4P

Use and interpretation of Growth Charts

3.Planning/preparation of Nutritive recipes 4P

1. Low-cost recipes
2. Cyclic menu
3. One dish meal

4.Field Study 1P

Assessmentofnutritionalstatusofaspecificdemographicgroupusingdirectparameters

5.FieldPlacement 2P

1. Formulating messages for Nutrition and Health Education
2. Development of audio-visual aids for Nutrition and Health Education

Planning, implementation and evaluation of Nutrition and Health Education programme

Major Compulsory Course

Internship/On-Job-Training: FSN-581-OJT

Credits-4 **Teaching Hours-60**

Internal Marks -30 **External Marks-70**

Course Outcomes:

1. Internship is a phase of training where in a graduate is expected to conduct actual practice of diet management and health care and acquire skills under supervision of a Practicing dietician so that he/she may become capable of functioning independently.
2. At the end of the Internship Training, the student shall be able to: Manage Diet prescription independently for clinically common disease conditions encountered to higher level.
3. Gain skill in planning therapeutic diets
4. Ability to be a health professional
5. Apply the knowledge for diet counseling
6. Competent to manage catering outlet
7. Period of internship:
8. Two-month internship in a multispecialty hospital with dietary department. Food Industry and NGO working with Malnutrition Project
9. Case Studies: Five to ten case studies of different disease conditions have to be take
10. during the internship.
11. Report to be submitted in the hospital ,Industry, NGO and institute (College)

M.Sc. II

III Semester

Food processing FSN-601-MJ

Credits-4 **Teaching Hours-60**

Internal Marks-30 **External Marks-70**

Course Outcomes:

1. Understand the science behind processing of foods and its impact on nutritive value of food stuffs
2. Provide in-depth knowledge on production of processed food products
3. Understand the changes in physiochemical properties of foods due to processing Condition
4. Impart a systematic knowledge of basic and applied aspects of food processing
5. Enable students to become familiar with the quality and safety of food

Contents:

UNIT- I:Cereal Processing; 12L

Structure, composition and nutritive value of cereal grains such as rice, wheat, maize, barley, oats and rye; Rice: parboiling, milling and pearling; Processing and milling of wheat, maize, barley, oats and rye; Millets: Structure, composition and nutritive value and processing of millets; Cereal Products: Flours and its quality; Processed products of rice, wheat and maize; By products utilization; breakfast cereals and extrusion; Effect of processing on nutritive value of cereals; changes in physiochemical properties of cereal starch and protein due to processing.

UNIT- II: Pulse Processing: 12L

Structure, composition and nutritive value of pulses; processing of pulses; Antinutritional factors: nature and health problems and methods used to eliminate toxic constituents; Pulse products: Dals, flours, texturized vegetable protein, protein concentrates, isolates and hydrolysates; Byproducts utilization; Effect of processing on nutritive value and physiochemical properties of pulses.

Nuts and Oil Seeds Processing: 12L

Structure, composition and nutritive value of nuts and oilseeds; Oil extraction methods and refining process; byproducts utilization; Refined vegetable oil quality; Hydrogenated fat and margarine; Effect of processing on nutritive value and physiochemical properties of vegetable oils; Rancidity and the types; Rancidity prevention methods.

UNIT-III: Vegetables Processing: 12L

Structure, composition and nutritive value of vegetables; Pigments: Classification, effects on

processing of vegetables; post-harvest changes in vegetables and storage; Preliminary processing of vegetables; Vegetable products: Fermented and non-fermented and its shelf life; Vegetable waste utilization; Effect of processing on nutritive value and physiochemical properties of vegetables. Fruits Processing: Structure, composition and nutritive value of fruits; post harvest changes in fruits and its storage; Concept of maturity, ripening and senescence; Fruit products: fermented and non fermented; Effect of processing on
nutritive value and physiochemical properties of fruits; Browning reactions: types and mechanism; prevention methods.

UNIT-IV: Milk Processing: 12L

Milk types, composition, physiochemical properties; Milk processing and its storage; Effects of processing on nutritive value and physicochemical properties of milk; Milk products: Fermented and non-fermented; Concept of imitation milk and dairy substitutes.

Egg Processing: Structure, composition and nutritive value of eggs; Egg quality evaluation methods; Egg processing and storage; Effect of processing on nutritive value and physiochemical properties of eggs; changes in egg quality during storage and preservation methods; Egg products and its functionality.

UNIT-V: Meat Processing: 12L

Meat types, structure, composition and nutritive value; Post mortem changes in meat; Meat processing and storage; Factors influencing meat quality; Ageing and tenderization of meat; Poultry: Muscle composition and nutritive value; Processing and storage of poultry meat;

Preservation methods for poultry;

Fish: Fish composition and nutritive value; Selection criteria for fish; Processing and storage;

Effect of processing on nutritive value and physiochemical properties of meat, poultry and fish.

References:

1. Srilakshmi, B. 2005. Food Science, New Age International (P) Ltd., Publishers, New Delhi.

2. Potter, N. and Hotch Kiss, J.H. (1996): Food Science, Fifth edition, CBS Publishers and Distributors, New Delhi

3. Julians, B.O. (1985). Rice Chemistry and Technology, 2nd edition, American Association Chemists, St. Paul Mimesota, USA.

4. Charley, H. (1982). Food Science, 2nd edition, John Wiley & Sons, New York.

5. Gould, G.W. (1995). New Methods of Food Preservation, Blackie Academic and Professional, London

6. Arthey, D. and Ashurst, P.R. (1996). Fruit Processing, Blackie Academic & Professional, London

7. Desrosier, N.W. and James N. (2007). Technology of food preservation. AVI Publishers

8.Dr G subbulaxmi, Dr Shobha A Udipi,Dr Padmini S Ghugare(2022) Food Processing and

Preservation. NEW AGE INTERNATIONAL PUBLISHERS

9.Manay, N. S. and Sharaswamy, S. M. (1997). *Foods: Facts and Principles* New Delhi: New Age International Publishers.

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Advanced Nutrition FSN-602-MJ

Credits-4 **Teaching Hours-60**

Internal Marks-30 **External Marks-70**

Course Outcomes:

1. Learn the basic principles of human nutritional requirements
2. Understand the composition of nutrients of food and its application in detail.
3. Calculate the estimated requirement of nutrients for humans
4. Understand the factors affecting requirements and availability of vitamins and minerals.
5. Comprehend the implications of deficiency of micronutrients on human body

UNIT-I :Energy **10L**

a. Components of energy requirements: BMR, RMR, thermic effect of feeding, physical activity. Factors affecting energy requirements, methods of measuring energy expenditure.

b. Estimating energy requirements of individuals and groups.

c. Regulation of energy metabolism and body weight: Control of food intake – role of leptin and other hormones.

UNIT-II: Carbohydrates 10L

Classification digestion,
absorption and utilization :
An overview

Simple and Complex carbohydrates, Non-starch polysaccharides and fibre constituents and their role in Nutrition and health maintenance.

Established and emerging evidence of fibre; daily requirements of fibre

Newer functional role of carbohydrates in human nutrition

Disorders related to carbohydrate metabolism

Polyols, Glycemic Index , Glycemic load and Satiety index: Clinical implications

UNIT- III: Lipids **10L**

Classification, digestion, absorption, transport – An overview

Functions of essential fatty acids, and Long chain PUFA and trans fats in human metabolism

Role of n3 and n6 fatty acids in health and disease

Hyperlipidemia and atherosclerosis - implications for heart health

Phytochemicals & Plant sterols in human nutrition

Diet and heart hypothesis: Effect of quality and quantity of fat on lipid status

Visible and invisible fats in diets

Human requirements of essential fatty acids; total fats

Assessment of Lipid status

Recommendations for heart friendly diets

UNIV-IV: Proteins **10L**

Classification, digestion, absorption and transport – an overview

Non protein compounds and their biological functions

Metabolism of proteins – Role of liver and muscles

The concept of nitrogen balance, obligatory nitrogen losses and their relevance to protein requirements

Human requirements for proteins

Current methodology for determining protein requirements and essential amino acid requirements

Protein deficiency and protein excess - implications for health in childhood and adulthood

The concept of quality of protein and method for measuring it.

UNIT-V : Fat & Water Soluble Vitamins **10L**

Absorption, transport and metabolism - an overview

Bioavailability : Modulators Biochemical functions

Assessment of vitamin status Interaction with other nutrients Toxicity and deficiency

RDA for vitamins and ensuring adequacy from diets

UNIT-VI : Macro-minerals Micro minerals **10L**

Absorption, transport and metabolism - an overview

Bioavailability : Modulators

Biochemical functions Assessment of vitamin status

Interaction with other nutrients Toxicity and deficiency

RDA for Minerals and ensuring adequacy from diets

Space foods and Organic food

References:

1. Shils ME, Olson JA, Shike M, Ross AC, Caballero B and Cousins RJ (2006). Modern Nutrition in Health and Disease (10thed.). Lippincott, Williams and Wilkins publications.

2. Zeigler EE and Filer Jr LJ (1996). Present Knowledge in Nutrition (7thed.). ILSI

Press, Washington DC 3. Human energy requirement (2004). Report of a joint FAO/WHO/UNU Expert consultation, Rome, 17-24 October 2001. FAO, Food & Nutrition technical Report series

3. Annual Reviews of Nutrition. Annual Review Inc, California, USA.

4. A. Catharine Ross, Benjamin Caballero Professor, Robert J. Cousins, Katherine L. Tucker, Thomas R. Ziegler M.D : Modern Nutrition in Health and Disease. (2013) 11th edition. Lippincott Williams and Wilkins

5. Bodwell, C.E. and Erdman, J.W. (1988) Nutrient Interactions. Marcel Dekker Inc. New York

6. Berdanier, C.D. and Haargrove, J.L. (ed) (1996): Nutrients and Gene Expression: Clinical Aspects. Boca Raton, FL CRC Press.

7.Baeurle, P.A. (ed) (1994) Inducible Gene Expression. Part I: Environmental Stresses and Nutrients. Boston: Birkhauser.

8. Chandra, R.K. (ed) (1992): Nutrition and Immunology. ARTS Biomedical. St. John's Newfoundland Annual Reviews of Nutrition. Annual Review Inc, California, USA.

9. Baeurle, P.A. (ed) (1994) Inducible Gene Expression. Part I: Environmental Stresses and Nutrients. Boston: Birkhauser.

10. Berdanier, C.D. and Haargrove, J.L. (1993): Nutrients and Gene Expression: Clinical Aspects. 1st Edition Boca Raton, FL CRC Press.

11. Bodwell, C.E. and Erdman, J.W. (1988) Nutrient Interactions. Marcel Dekker Inc. New York

12.Chandra, R.K. (ed) (1992): Nutrition and Immunology. ARTS Biomedical. St. John's Newfoundland.

13. Indian Council of Medical Research. Nutritive Value of Indian Foods - Latest Publication.

14. Ross C., Caballero B., Cousins R., Tucker K., Ziegler T. (2013): Modern Nutrition in Health and Disease.11th edition. Jones and Bartlett Publishers, Inc

WHO Technical Report Series. World Reviews of Nutrition and Dietetics

Functional Foods- FSN- 603-MJ

Credit -2 **Teaching hours -30**

Internal Marks-15 **External Marks-35**

Course Outcomes:

1. Learn the basic principles and regulations in relation to the functional food.
2. Understand the application of functional food in various disease conditions.
3. Comprehend the current trends of research in the field of nutraceuticals.

UNIT-I: Introduction to Functional Foods and Nutraceuticals **7L**

History and Definition of Functional Foods and Nutraceuticals

Classification of Functional Foods and Nutraceuticals

Perceived Effects of Diet on Disease Prevention

UNIT- II: Probiotics Prebiotics and Synbiotics **8L**

Introduction to Probiotics, Prebiotics and Synbiotics

Taxonomy and Important Features of Probiotic Microorganisms

Health Benefits of Probiotics

Probiotics in various Foods: Fermented Milk Products, Non-milk Products etc.

Quality Assurance of Probiotics and Safety

Prebiotics Oligosaccharides Dietary Fiber

Resistant Starch Gums **Synbiotics**

UNIT-III: Food Components with Potential Health Benefits **7L**

Polyphenols, Tannins and Catechins Phytoestrogens

Phytosterols Glucosinolates Carotenoids and Anthocyanins Lycopene

Curcumin Organosulfur Compounds

An Introduction to Antinutritional Factors in Plant Foods

Phytate Protease Inhibitors

Amylase Inhibitor Saponins and Haemagglutinins

UNIT-IV: Spices and Condiments **8L**

An Introduction to Active Biodynamic Principles in Spices, Condiments and Other Plant Materials

Resveratrol Quercetin and Kaempferol Cinnamaldehyde, Crocin and Luteolin

Capsaicin Piperine Eugenol Gingerol

Apigenin Rosmarinic Acid Thymoquinone Fenugreek and Diosgenin

References:

1) Cho S. S. and Dreher, M.L. (2001): Handbook Dietary Fibre, Marcel Dekker Inc., New York.

2)Frei, B. (1994): Natural antioxidants in human health and disease. Academic Press, San Diego.

3)Fuller, R. ed. (1997) Probiotics Applications and Practical Aspects, London: Chapman and Hall, New York.

4) Gibson, G., Williams, C. eds (2000): Functional Foods. Wood head Publishing Ltd. U.K.

5)Goldberg, I. Ed (1994): Functional Foods: Designer Foods, Pharma Foods, Nutraceuticals, Chapman & Hall, New York.

6) Salminen, S. A. Von Wright (eds) (1998): Lactic acid bacteria: microbiology and functional aspects, 2nd edition, Marcell Dekker Inc. New York.

7) Tannock, G.W. (1999): Probiotics: A critical review, Horizon Scientific Press, UK.

8) Wildman, R. E. (2016). Handbook of Nutraceuticals and Functional Foods. CRC Press

9) Gibson, G. R. and Williams, M. C. (2001). Functional Foods Concept to Product. CRC Press.

10) Vattem, D.A. and Maitin V.(2016). Functional Foods, Nutraceuticals and Natural Products, Concepts and Applications. DEStech Publications, Inc

11) Gupta, R. C. (2016). Nutraceuticals: Efficacy, Safety and Toxicity. Academic Press.

12) Rekha Sharma (2023). Introduction to Functional Foods and Nutraceuticals. PharmaMed Press / BSP Books, Hyderabad, India

13) G Subbulaxmi, M Subhadra (2014)Functional Foods and NutritionDaya publishing House New Delhi

Practical III FSN- 604-MJP

Credits -4 **Teaching hours -120**

Internal Marks-30 **External Marks-70**

Practicals:

1. Introduction to energy requirement and expenditure and Factors which influence energy expenditure 1P
2. Calculating BMR using Kymograph 1P
3. Calculating energy expenditure 1P
4. Calculation of energy supplied by Carbohydrates in diet 1P
5. Survey of high fiber products Available in Market Enlisting high and low glycemic index rich foods 1P
6. Evaluation of Protein Quality of Dishes 1P
7. Planning and critical evaluation of suitable dishes for Supplementary feeding program 1P
8. Preparation of fruit preserves (jam, jelly) 1P
9. Preparation of vegetable preserves (pickle) 1P
10. Dehydrated products – vegetables dices tray drying, osmotic dehydration of seasonal fruit. 1P
11. Tomato processing 1P
12. Fruit pulping / juice / beverage preparation 1P
13. Preparation and standardization of traditional Indian fermented foods 1P
14. Bread making - texture. 1P
15. Confectionery 1P

Food Hygiene and Sanitation FSN-605-OE

Credit-02 **Teaching Hours – 30**

Internal Marks-15 **External Marks-35**

Course Outcomes:

1. Gain an understanding of food hygiene, sanitation, and safety during food processing unit operations.
2. Describe food borne illness symptoms and preventative methods
3. Examine the sources of food contamination

UNIT- I : Introduction to Food Hygiene 7L

Meaning , Definition, Food safety- Hazards to Safe Food Basics of food hygiene, Personal hygiene, Food handling habits,

handling potable water supply.

Microbial standards for foods**.**

Some important foods

UNIT- II : Sanitation Overview 8L

Concept, Management of Sanitation, Microorganisms and Their Relationship to Sanitation, Sanitary procedures to be followed while preparation, cooking and handling of food

Cleaning and Disinfection Method of cleaning and disinfection. Detergents and Sanitizer. Sanitation in food service. cleaning compounds, sanitation

methods, waste disposal strategy (solid and liquid waste) and

pest control

UNIT-III: Food Contamination 7L

: Definition, Sources, Prevention, Hazard Analysis and Critical Control Points (HACCP), Food Poisoning and Infections, Bacterial food infection- E.coli, Salmonella Factors contributing to physical, chemical and biological

contamination in food chain, prevention and control of food

borne hazards, Regulation of food sanitation, sources of

contamination,

UNIT- IV : **Personal hygiene and management** 8L

Importance of personal hygiene in life and its maintenance ,Sanitary practices to be observed by food holders ,Importance of good habits and Need for training in sanitation procedure

References:

1. Principles of Food Sanitation, 4th ed., Norman G. Marriott, 1999.

2. Sanitation in Food Processing, John A. Troller, 1993. Academic Press
3. Roday, Sunetra. (2017). Food Hygiene and Sanitation with case studies (2nd ed.). McGraw Hill.
4. Lewis, Roger. (2017). Essentials of Food Safety The Fight Against Micro organisms.iUniverse.
5. Marwah, Kavita. (2022). Food Hygiene. Meri Pustak.Com.
6. OrolugbagbeGboyega (2015). Handbook of Food Safety. Astral International Pvt. Ltd.

Food Hygiene and Sanitation FSN-606-OEP

Credits-02 **Teaching Hours – 60**

Internal Marks-15 **External Marks-35**

Practicals:

1. Preparation of inventory list to check personal hygiene of food handlers 2P
2. Hand hygiene and wash hand technique 2P
3. Care of skin, hair, hand , feet, nails and mouth Hygiene and Sanitation:2P
4. Estimation of hardness of water using EDTA method 2P
5. Microbial Contamination of Water 3P
6. Small scale methods of purification of water 2P
7. Disposal of waste(dry and wet)Visit to a food service unit 1P

Food Safety and Quality Control FSN-607-OE

Credit-02 **Teaching Hours-30**

Internal Marks-15 **External Marks-35**

Course Outcomes:

1. To emphasize on the importance of food safety, food quality and food laws and regulations
2. Describe the importance of quality control system in food plants.
3. Classify the different types of food labelling and label claims
4. Capable of identifying preservatives and detecting common adulterants in food
5. Perform testing of food quality with subjective and objective tests

UNIT- I: Food Quality – 7L

Meaning and definition of food quality

Quality factors in foods, indicators of food quality.

Meaning, importance and ways of Food Quality Assessment.

Enrichment and fortification of food

Food Adulteration - Meaning and detection of common adulterants

UNIT-II: Testing of Food Quality: 8L

Food Quality meaning and need of food quality testing; Types of evaluation -Subjective and objective. Subjective evaluation methods based on difference rate, sensitivity etc; Objective evaluation methods – tools and instruments used; quality standards for cereal, pulses and legumes, vegetables and fruits, milk, egg and flesh foods, fat and sugar and related products

UNIT- III: Food Safety **7L**

Concept and importance of safe foods, Importance of sanitation and hygiene in foods

Integrated approach to food safety

Good hygiene practice (GHP)

Good manufacturing practice (GMP)

Hazard analysis critical control point (HACCP)

Microbial risk assessment

Quality management ISO series

Total quality management

UNIT-IV: Food Laws and Standards **8L**

International and National food laws, Essential Commodities Act (ECA). Indian Standards Institute (ISI), Bureau of Indian Standards (BIS), AGMARK,

Prevention of Food Adulteration Act (PFA), Fruit Products Order(FPO),

Food Safety and Standards Bill 2005, Codex Alimentarius, World Trade Organization (WTO) ,Joint Expert Committee for Food Additives (UN Food and Agriculture Organization and World Health Organization JECFA), Agricultural and Processed Food Products Export Development Authority (APEDA)

References:

1. Gould ,G.W. (1995). New Methods of food preservation ,Blackie Academic & professional**,** London

2. Connor J.M.and Schick W.A.(1997), Food Processing An Industrial Powerhouse in Transition .Jon Wiley and Son, New yolk.

3. Stadelman W.J. and Contteril , D.S. (1986) Egg Science and Technology, AVI publishing Co., INC, Westport.

4. Arthey ,D. and Ashurst ,P.R.(1996) ,Fruit processing ,Blackie Academic and professional London

5. Phillips ,R.D. and Family J.W. (1989) Protein Quality & Effect of processing, Marcel Dekker,INC, New York.

6. Inglett. G.C. and Munet, L. (1980), Cereals for Food and Beverages, Academic press, New York.

7. Subbulakshmi, G and Udipi, S. A. (2001). Foods Processing and Preservation, New Delhi: New Age International (P) Ltd. Publishing.

8. Scottsmith and Hui Y.H (Editiors) (2004) Food Processing – Principles and Applications London Blackwell Publishing

9. Borvers, J. (1992). Food Theory and Application (2ndEd), New York: Maxwell MacMillan International Edition.

10. Manay, N. S. and Sharaswamy, S. M. (1997). Foods: Facts and Principles New Delhi: New Age International Publishers.

1. Mahindra N. S, 2008, Food Additives, Characteristics, Detection and Estimation, APH Publishing Corporation, New Delhi

2. Ward law G.M, Hamp J S, 2007, Perspectives in Nutrition, 7th edition, McGraw Hill

3. The Food Safety and Standards Act along with Rules and Regulations, 2011, Delhi, Commercial Law Publishers (India) Pvt Ltd.

4. Khanna K et al, 2013, Text Book of Nutrition and Dietetics, Phoenix publications

Food Safety and Quality Control FSN-608-OEP

Credit-02 **Teaching Hours-60**

Internal Marks-15 **External Marks-35**

Practicals:

1. Preparation of Jams , Jellies and souses 2P
2. Food Adulteration Tests: Cereal and cereal products, Pulses, Milk and milk products, Fats and oils, Spices and condiments, Sugar 3P
3. Food labelling- Guidance on understanding of various aspects of Nutrition labelling.
4. Identification of packaging materials 2P
5. Preparation of soy milk and soy paneer 2P
6. Market Survey :Visit to fruit &vegetable market for quality assessment 2P
7. Study of nutritional information and ingredients of at least 10 packed food products for preservatives and additives 2P
8. Study of minimum 10 food products for standards of BIS, AGMARK and FSSAI 2P

Research Project I FSN-631-RP

Credits-04 **Teaching Hours-60**

Internal Marks-30 **External Marks-70**

Course Outcomes :

1.Formulate research topic on thrust areas

2. Draw sample by using appropriate techniques

3. Develop tools of data collection

Contents :

1. Identify the research areas in Food Science and Nutrition
2. Statement of research problem/ topic.
3. Collect review in selected variables from print and non-print sources.
4. Find the key words with dictionary meaning write the operational definitions
5. Define the specific objectives of the study.
6. Define variables of the study and their measurements.
7. Design conceptual model of the study.
8. Identify the population of study and prepare sampling plan.
9. Draw the sample by using appropriate sampling techniques.
10. Develop tools of data collection.
11. Prepare time plan for the research study and note down facilities required for the study.

Clinical Nutrition and Patient Counseling FSN-651-MJ

Credit - 04 **Teaching hours – 60**

Internal Marks-15 **External Marks-35**

Course Outcomes:

1.Impart knowledge on etiology of various medical conditions for application of medical nutritional therapy.

2.Introduce the technical concepts in counseling, skills required by a dietician, her/his role in a hospital.

3. Enable the student's ability to interpret pathological / clinical parameters in health &disease. Dietitian as part of the medical team and outreach services.

UNIT I: 6L

Medical Nutritional therapy in renal diseases: Nephrotic syndrome, Nephritic syndrome, ARF, CRF/ESRD, Dialysis and Renal Transplant, Urinary Calculi

UNIT II: 6L

Medical Nutritional therapy for: Surgery, burns, sepsis, and trauma.

UNIT III: 6L

for Anemia: Types of anemia, nutritional Support in Anemia, Diffentiating Anemia's, Prevention

UNIT IV : 6L

Medical Nutritional therapy in diseases of musculo skeletal system: Rheumatoid & osteoarthritis, gout, osteomalacia & osteoporosis, muscle disorder

UNIT V: 6L

Medical Nutritional therapy for oral and dental health: Periodantal Disease, Dental Erosion, Calcium intake

UNIT VI: 6L

Medical Nutritional therapy in malabsorption syndrome: Definition, Causes, Symptoms, Celiac Sprue, Tropical sprue, Crohn's Disease, Short Bowel syndrome

UNIT VII: 6L

Dietary modification in food allergy and intolerance: signs of food sensitivity, differentiate between food allergy and intolerance

UNIT VIII: 6L

Ayurveda- Health Concept of Ayurveda ,Elements, Principles, Pillars Methods of Ayurveda, Ayurvedic concept of Food and Nutrition

UNIT IX: 6L

Patient counseling: Medical history and patient profile techniques of obtaining relevant information. Record of nutritional status Correlating Relevant Information and identifying areas of need.

UNIT X: 6L

The nutrition care process: Setting goals and objectives for care, Patient Education, Dietary Prescription. Working with hospitalized/ out patients (adults, pediatric, elderly, and handicapped), Motivating patients Counselling approach, skills, patient/participant interview.

References:

1. Shils Maurice, James A. Olson, Skike Mosche, Catherine Ross, 2006, Modern Nutrition inhealth and disease, Tenth edition, Williams and Wilking pub.

2. Katz, D.L., 2014. Nutrition in clinical practice. Lippincott Williams & Wilkins.

3. Bahl Saroj and J.F Hickson, Nutrition care for HIV Positive patient, A Manual forindividuals and thei caregivers

4. Pandya Sanjay, 2007, Practical guidelines on fluid therapy, Second edition.

5. Mahan Kathleen L, Sylvia Escott Stump, 2001, Krause's, Food nutrition and Therapy, W.B. Saunders Co

6. Mahan, L.K. and Escott-Stump, S., L. Raymond, J., & Krause, MV 2012. Krause's foodand the nutrition care process.

7. Mahan Kathleen L, Sylvia Escott Stump, 2001, Krause's, Food nutrition and Therapy W.B. Saunders Co

8. Anthro, W.H.O., 2006. Software for assessing growth and development of the world'schildren. World Health Organization.

9. Sanders, T.A., 2004. Diet and general health: dietary counselling. Cariesresearch, 38(Suppl. 1), pp.3-8.

Sports Nutrition FSN-652-MJ

Credit - 04 **Teaching Hours - 60**

Internal Marks-30 **External Marks-70**

Course Outcomes:

1.Familiarize the special nutritional requirements for physical activities related to sports and exercise

2.Provide knowledge in body composition and improve the performance of Sportspersons

3. Develop an evidence-based approach to the application of the science of nutrition to optimize performance

4. Acquire knowledge and skill in sports nutrition, nutritional and body

5. Learn knowledge and skill in physical fitness and fitness tests for sports persons

UNIT – I: Sports Physiology **12L**

Introduction to Fitness, Muscular adaptations during endurance exercise, Hormonal adaptations during endurance exercise, Role of nutrition in stress, Fracture and injury. Outcome 1 Students able to identify the components of health and fitness and the role of nutrition.

UNIT- II: Body Composition and Weight Management in Sports **12L**

Body build, size and body composition, levels of body composition, methods to measure body composition- Direct and indirect, Significance of body composition measures for athletes Body composition and performance Safe, effective weight loss, Weight gain

UNIT –III: Exercise Performance and Nutrition **12L**

Energy expenditure during physical activity, Carbohydrates and performance, Fat metabolism and performance, Effect of exercise on protein requirements, Vitamins and Minerals, Fluid and electrolyte loss and replacement in exercise.

UNIT-IV: Nutrition in Sports **12L**

Composition assessment, weight management and prescription of diets for sports persons Nutritional requirements in Sports Events-Team, Power and Endurance events, Pre-game and Post game regime. Carbohydrate loading, Water and electrolyte balance.

UNIT-V: Nutritional Ergonomics & Measures of Performance and Physical Fitness **12L**

Ergogenic aids and Supplements-Types, Potential and Concerns, Work Capacity, Physical capacity tests, Physical fitness, parameters of fitness, fitness tests.

References:

1. Bamji, S.M., Rao, N.P., Reddy, V. (1998).Text book of Human Nutrition, Oxford and IBH Publishing C. New Delhi.
2. Burke, L., &Deakin, V. (2010). Clinical Sports Nutrition,4th Edition, McGraw-Hill.
3. Bamji, M.S. (2017). Textbook of Human Nutrition, Oxford and IBH Publishing Co, New Delhi.
4. Driskell, J.A. & Wolinsky, I. (2016).Sports Nutrition - Vitamins and Trace Elements, 2nd Edition,
5. Volume of Nutrition in Exercise and Sport Series – CRC-Taylor & Francis
6. Susan, A. L., Samantha, J. S., Susan, M. S., Adam, L.C. (2011). Sport and Exercise Nutrition, A John Wiley & Sons, Ltd., Publication.
7. Fink, H.H.,Mikesky, E.A.,Burgoon, A.L.(2012).Practical Applications in Sports Nutrition, 3rd Edition, Publishers -Jones and Barlett Learning, USA.
8. Gibney, J.M., Macdonald, A.I., Roche, M.H. (2003). Nutrition and Metabolism, Blackwell Publishing.
9. Maurice, B.S.,Moshe,S.A.,Catherine, R., Benjamin, C., Robert, J. C. (2006).Modern Nutrition in Health and Disesase. Edited by Lippincott Williams & Wilkins.
10. Melvin, W. (2007). Nutrition for Health, Fitness and Sport, 8th Edition, McGraw-Hill.
11. Cherie, M. (2004).Practical Nutrition for a Fit Life, Kendall-Hunt Publishers
12. WHO. (1995).Physical Status: The Use and interpretation of Anthropometry, Report of a WHO Expert Committee, Geneva.
13. Web Resources:

    https://samples.jbpub.com/9781284034851/Chapter_6.pdf

    https://www.pdfdrive.com/exercise-physiology-e87.html

    http://downloads.lww.com/wolterskluwer_vitalstream_com/samplecontent/9780781797818_McArdle/samples/Chapter28.pdf

    https://boxing.nv.gov/uploadedFiles/boxingnvgov/content/HotTopics/Nutrition_for_Athletes.pdf

Food Analysis- FSN-653-MJP

Credit -04 **Teaching Hours-120**

Internal Marks-30 **External Marks-70**

Course Outcomes:

1. Demonstrate proficiency in basic laboratory techniques used in food analysis.
2. Determine the proximate composition of food products including moisture, ash, fat, protein, fiber, and carbohydrates.

Practicals:

1.Handling of equipment and instruments 1P

2.Preparation of samples, solutions and buffers 1P

3.Flame photometry, Chromatography 1P

4.Atomic absorption spectrophotometer 1P

5.Analysis of antinutritional factors 1P

6.Estimation food adulteration 3P

7.Estimation of moisture content in food 3P

8.Estimation of titrable acidity 3P

9.Analysis of protein kjeldhal method 4P

10.Analysis of fat by soxhlet apparatus 4P

11.Analysis of crude fiber 3P

12.Estimation of carotene by gel electrophoresis 3P

13.Analysis of minerals sodium, potassium by AOAC 2P

References:

1. AOAC 1995.Association of Official Analytical Chemists.Washington, DC.
2. Gruenwedels DW &Whitakor JR 1984.Food Analysis: Principles and Techniques.Vols. IVIII. Marcel Dekker.
3. Joslyn MA. 1970. Methods in Food Analysis: Physical, Chemical and Instrumental Methods of Analysis.Academic Press.
4. Pomeranz Y &Molean CE. 1977. Food Analysis Theory and Practice. AVI Publ.
5. Sawhney SK & Singh R. 2000.Introductory Practical Biochemistry.Narosa.

Pediatric Nutrition FSN-654-OE

Credits-2 **Teaching Hours-30**

Internal Marks-15 **External Marks-35**

Course outcomes:

1. Familiarize about the nutrition of infants and the childhood immunization schedule.
2. Provide knowledge about the nutritional management of infants and ailments of newborn
3. Educate about the importance of nutritional care and nourishment of children
4. Learn about clinical nutrition in infants and other clinical conditions.
5. Provide knowledge on the nutritional management of children with special conditions

UNIT- I: Nutrition in Infancy and Immunization Schedule 7L

Infancy - Physiological development, assessment of nutritional status. Anthropometric measurements, biochemical parameters, clinical & dietary data of infants. Nutritional and food requirements for infants. Immunization schedule during infancy and childhood.

UNIT- II: Nutritional Management of Infants and Newborn Sickness 8L

Nutritional management of premature baby, low birth weight babies and children with developmental disabilities. Infant lactation- Characteristics, causes and complications, feeding methods, growth and nutritional assessment of infant's lactation. Identification of newborn sickness-Detection of abnormal signs- cyanosis, jaundice, respiratory distress. Bleeding, seizures, refusal and feed, abdominal distention, failure to pass meconium and urine of sick newborn.

UNIT- III : Clinical Nutrition in infants - Malnutrition and other clinical conditions 7L

Nutritional management in malnutrition -Protein–energy malnutrition (PEM). Anaemia, scurvy, rickets, vitamin A deficiency. Childhood Obesity – Causes and Complications. Underweight and overweight nutrition- short term and long-term consequences in infants

–Nutritional management of GI Disturbances – Constipation, Diarrhoea. Nutritional management of Typhoid, TB and hepatitis of infants. Nutritional management of Renal disorders. Nutritional management of cardiovascular diseases

UNIT- IV : Nutritional Management For Children with Special Conditions 8L

Inborn errors of Metabolism-Lactose intolerance, celiac disease, inflammatory bowel disease, PKU, Maple syrup urine disease, Homocystinemia, Tyrosinemia, Galactosemia

Nutritional management for children with special conditions - Autism and ADH (Attention Deficit Hyperactivity disorder), epilepsy and AIDS. Down Syndroms Cerebral palsy

References:

1. Elizabeth, K.E. (2022). Nutrition and Child Development, 6th Edition, Paras Medical Publisher.
2. Maya, B, William, W., Hay, Jr., Myron, J. L. (2022). Current Diagnosis & Treatment Pediatrics, 26th Edition, McGraw Hill / Medical Publishers.
3. Praveen, S., Goday., Cassandra, W. (2022). Pediatric Nutrition for Dietitians, CRC Press Publisher.
4. Gunasekaran, D. (2021). Growth and Nutrition in Children, 1st Edition, Paras Medical Books Pvt. Ltd Publisher.
5. Atul, C. (2018). Concepts in Pediatrics, Nutrition, IP Innovative Publication Pvt. Ltd. Sharma, M. (2017). Basic Pediatric Nutrition, Jaypee Brothers Medical Publishers.
6. Pooja, G. (2017). Food, Nutrition and Health, S Chand Publishing, India.
7. Koletzko, B. (2015). Pediatric Nutrition in Practice, World Review of Nutrition and Dietetics Book 113, 2nd revised Edition,
8. S. Karger Publisher. Sibal, A. (2015). Textbook of Pediatric Gastroenterology, Hepatology and Nutrition, Jaypee Brothers Medical Publishers; 1st Edition.

Web Resources:

https://www.chla.org/sites/default/files/migrated/Chapter1_NutritionalNeeds.pdf

https://www.euro.who.int/__data/assets/pdf_file/0004/98302/WS_115_2000FE.pdf

https://www.slideshare.net/wajihahwafa/infant-nutrition-59143887

https://www.lybrate.com/topic/typhoid-diet-chart

https://www.medindia.net/patients/lifestyleandwellness/diet-during-typhoid.htm

https://www.slideshare.net/AlHijab1/typhoid-fever-111800447

Pediatric Nutrition FSN-654-OEP

Credits-2 **Teaching Hours-60**

Internal Marks-15 **External Marks-35**

Practicals:

1. Pediatric Nutritional Assessment:-. Anthropometric measurements, biochemical parameters, clinical and dietary assessment methods. 2P

2.Measuring, recording and plotting growth on growth charts. Use of growth reference/ standards (Field work) Normal nutrition for infants 2P

3.Guidelines on breastfeeding and complementary feeding. 2P

4. Market survey of infant formulae and complementary foods. Planning complementary feeds as per the guidelines. Preparation of ARF. Nutrition in childhood and adolescence:3P

5.Planning for preschool child, the school-aged child and adolescents 2P

6. Nutritional concerns: - Guidelines for management for PEM, SAM, and vitamin A deficiency 2P

7. Nutritional requirements for Inborn Errors of Metabolism - PKU, Maple syrup urine disease, Homocystinemia, Tyrosinemia, Galactosemia, Glycogen storage disorder Nutritional Management of diarrhea Ketogenic diet, Atkins diet Feeding challenges for developmental disabilities, feeding devices Nutritional requirements and management of - type 1 DM, nephrotic syndrome 2P

Food Product Development FSN-656-OE

Credit- 02 **Teaching Hours -30**

Internal Marks-15 **External Marks-35**

Course Outcomes:

1. Learn the basic principles of food product development.
2. Understand the process of development of food product.
3. Understand the market and develop new food product

UNIT I: Food Needs and Consumer Preference 7L

needs and types of food consumption Trends, economic, psychological, anthropological and sociological dimensions of food consumption. Trends in social changes and its role in diet pattern-consumer research and the market identifying the need for new products

UNIT II : Introduction to Food Product Development **8L**

Phases in new food product development; Generation of new product ideas – internal sources of idea, external sources of idea and marketplace analysis. Screening of the ideas, team approach and involvement of various departments, objectives of screening, criteria for screening ideas.

Prototype development, standardization of the recipe, statistical modelling for product formulation- variables, test levels, Black-Box Modeling and input-output consideration process and mixture experiment, classical one-factor experimental method and multiple factor experiment

UNIT III : Standardization and Large Scale Production 7L

Process design, equipment needed; establishing process parameters for optimum quality; sensory evaluation; lab requirements; different techniques and tests; statistical analysis; application in product development and comparison of market samples; stages of integration of market and sensory analysis

UNIT IV : Food Packaging **8L**

Importance, Definition, Principles of packaging, Classification, Types of packaging material: Metal, glass, Paper, plastic, edible packaging material, miscellaneous packaging materials,Packaging Laws and Regulations as given under FSSAI Food labelling

References:

1. Sudhir Gupta (2007) Handbook of Packaging Technology, Engineers India Research Institute, New Delhi
2. Khanaka, S.S., Entrepreneurial Development, S. Chand and Company Ltd, New Delhi, 2006. 3. Suja, R. Nair(2004) Consumer Behaviour and Marketing Research, 1st Edition,

Himalaya Publishers

3. BARCLAY, I., DANN, Z. & HOLROYD, P. (2001) New Product Development: A Practical Workbook for Improving Performance (London: Butter worth Heinemann).
4. CLARK, K.B. & WHEELWRIGHT, S.C. (1993) Managing New Product and Process Development (New York: The Free Press). CODLING, S. (1996) Best Practices in Benchmarking (Houston: Gulf Publishing Co.).
5. COOPER, R.G. & KLEINSCHMIDT, E.J. (1995) Benchmarking the firm's critical success factors in new product development. Journal of Product Innovation Management, 12, 374–391.
6. COUGHLAN, P. & BRADY, E. (1995) Self-assessment and benchmarking product development in five Irish firms. Journal of Managerial Psychology, 10(6), 41–47.

Food Product Development FSN-657-OEP

Credit- 02 Teaching Hours -60

Internal Marks-15 External Marks-35

Course Outcomes:

1. Development new food product which are nutritious, cost effective and marketable
2. Understand the market and develop new food product

Practicals:

1. Development of new innovative food product 3P
2. Sensory evaluation and shelf life study of the food product. 3P
3. Detection simple test for food adulterants 3P
4. Study of food labelling and legal requirements. 3P
5. Survey, Consumer survey to identify new products in terms of
   Line Extension 3P
   Repositioning Existing Products
   New form/Reformulation
   New packaging of existing products
   Innovative products
   Creative Products

References:

1. Fuller G.W. (1994) – New Product Development : From concept to market place, CRC Press, New York.

2. Craft, E and Saguy I.S. (1991) – Food Product Development : From concept to market place, Van Nostrand Reinhold, New York.

3. Oickle, J.G. (1990) – New Product Development and Value Added. Food Development Division Agriculture, Canada.

4. Frazier W. and Westthoff. D. (1988) :Food microbiology, Tata McGraw-Hill Publisher

5. Subbulakshmi G. and Udipi S.A. (2001) : Food Processing and Preservation, New age international (P) ltd. Publication

Research Project II FSN-681-RP

Credits-06 **Teaching Hours-90**

Internal Marks-50 **External Marks-100**

Course Outcomes:

1. Analyze data by using statistical software
2. Present and interpret the analyzed data
3. Write research report in scientific format

Contents:

1. Edit the collected data for adequacy and completeness.
2. Classify the nominal and ordinal data.
3. Decide the statistical test according to the nature of data
4. Use software for data analysis.
5. Prepare table and describe it.
6. Prepare graphs and figures by using software/ computer
7. Write preliminary pages.
8. Write main text in scientific format.
9. Prepare the draft report.
10. Check for language, style and layout of the report.
11. Prepare final report.
12. Plagiarism check by standard software.

Guideline for writing Research Project Based on Trends and Issues in the subject Research Project should consist following chapters:

1. Introduction
2. Review of Literature
3. Methodology/ Materials and methods
4. Results and Discussion
5. Summary and Conclusion
6. Reference (APA style)

7 Appendix

Instructions:

1. Research project report should be according to standard norms of scientific writing.
2. Internal assessment will be on the seminar presentations
3. Research project report should be according to standard norms of scientific writing.
4. Internal assessment will be on the seminar presentations
5. Before finalization of the topic
6. Mid review
7. Final presentation
8. Plagiarism check report is mandatory with report