



Savitribai Phule Pune University

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: Major Core Courses (FSN501MJTOFSN504MJP)		
FSN501MJ	Human Nutrition	4T
FSN502MJ	Food Science	4T
FSN503MJ	Human Physiology	2T
FSN504MJP	Practical-I	4P
Semester I: Major Core Courses Credits		14(10T +4P)
Semester I: Major Elective Courses (FSN510OEto FSN513OEP)		
FSN510OE	Food Service Management	2T
FSN511OEP	Food Service Management(Pr)	2T
FSN512OE	Nutrition Exercise and Fitness	2P
FSN513OEP	Nutrition Exercise and Fitness (pr)	2P
Semester I: Major Elective Courses Credits		4T/P
Major Compulsory Course		
FSN541RM	Research Methodology	4P
Total cumulative credits required for Semester I		22
Semester II: Major Core Courses (DIT551MJ to DIT554MJP)		
FSN551MJ	Nutrition through lifecycle	4T
FSN552MJ	Therapeutic Nutrition	4T
FSN553MJ	Nutritional Biochemistry	2T
FSN554MJP	Practical-II	4P
Semester II: Major Core Courses Credits		14(10T +4P)
Semester II: Major Elective Courses (FSN560OE toFSN563OEP)		

FSN560OE	Food Microbiology	2T
FSN561OE	Food Microbiology(Pr)	2T
FSN562OEP	Public Health and Nutrition	2P
FSN563OEP	Public Health and Nutrition(Pr)	2P
Semester II: Major Elective Courses Credits		4T/P
Semester II: Major Compulsory Course: Internship/ On-Job-Training		

FSN581OJT	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 (DIT601MJ TODIT604MJP)		
FSN 601MJ	Advanced Food Science	4T
FSN 602MJ	Pediatric and Geriatric Dietetics	4T
FSN 603MJ	Functional Foods	2T
FSN 604MJP	Practical III	4P
Semester III: Major Core Courses Credits		14(10T +4P)
Semester III: Major Elective Courses (DIT605OEtoDIT608OEP)		
FSN 605 OE	Food Hygiene Sanitation	2T
FSN606OEP	Food Hygiene Sanitation Practical	2P
FSN607OE	Food Safety and Quality Control	2T
FSN 608 OEP	Food Safety and Quality Control Practical	2P
Semester III: Major Elective Courses Credits		4T/P
Major Compulsory Course (DIT609RP)		
FSN631RP	Research Project I	4P
Total cumulative credits required for Semester		22

III		
Semester IV: Major Core Courses (DIT651MJ To DIT653MJP)		
FSN651MJ	Clinical Nutrition & Patient Counseling	4T
FSN652MJ	Advanced Dietetics	4T
FSN653MJP	Food Analysis	4P
Semester IV: Major Core Courses Credits		12 (8T +4P)

Semester IV: Major Elective Courses (DIT654OE to DIT657OEP)		
FSN654OE	Food Processing	2T
FSN655OEP	Food Processing(Pr)	2P
FSN656OE	Food Product Development	2T
FSN657OEP	Food Product Development (Pr)	2P
Semester IV: Major Elective Courses Credits		4T/P
Major Compulsory Course (FSN681 RP)		
FSN681RP	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 501MJ

Credits -4 Teaching Hours -60

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. To learn the metabolic functions of macronutrient and their role in health and disease
4. To understand the implications of deficiency and toxicity of macronutrients and to assess their status in the body.
5. To stay updated with emerging concepts in macronutrient science.

UNIT-I History of Nutrients

Energy: Components of energy requirements: BMR, RMR, thermic 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: 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: 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: Nutritional significance of fatty acids–SFA, MUFA, PUFA: functions and deficiency,

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 Vitamins: History, Sources, requirements, functions, deficiency diseases.

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: 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. Michael J. Gibney, Hester V Vorster and Frans J Kok (2003) Introduction to Human Nutrition. Blackwell publishing Oxford, U.K.
2. Kathleen Mahan and Sylvia Escort –Stump (2000):Food, Nutrition & Diet Therapy 11th Edition, W.B. Saunder's Company London.
3. Roach Benyan (2003) Metabolism and Nutrition Elsevier Science Ltd. Philadelphia. U.S.A.
4. SusanG.Dudek(2007) Nutrition Essentials for Nursing Practice, Lippincot Willeamsd Wilkias, Philadelphia.
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): Modern Nutrition In Health And Disease, 8th 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 Allowances for India, A Report of the Expert Group of the Indian Council of Medical

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. Swaminathan M. (1991): Advanced Text Book on Food & Nutrition, Vol.I&II(2nd Edition, Revised), Bangalore printing & Publishing Ltd.
12. Chaney, M.S.- Rose, M.L. & Wisehi J.C. Nutrition (1979): Houghton Mifflin, Boston.
13. Official Methods of Analysis (2000) : Association of Analytical Chemists – Association of Official Agricultural Chemists, Washington D.C.
14. National Institute of Nutrition, (1983): Manual of Laboratory Techniques.
15. Hawk P. B., Oser B. L. and Summerson, (1972): W.H. Practical Physiological Chemistry, Ed. Bernard Oser, Tata McGraw Hill.
16. Pike, R.L. and Brown, M.C. (1970): Nutrition An Integrated Approach, Wiley Eastern Private Ltd.

Food Science FSN 501MJ

Credits -4 Teaching Hours -60

Course Outcomes-

- 1) understanding of composition of various food stuffs
- 2) To familiarize students with changes occurring in various food stuffs as a result of processing and cooking
- 3) Enable students to use the theoretical knowledge in various applications and food preparations

UNIT- I

Introduction to Food Science. 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- Type, Composition, Nutritive value, Effect of cooking, processing and 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- Structure and Nutritional composition of egg, Evaluation of egg quality, Egg cookery.

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

UNIT-IV

Fats and Oils- Type, Nutritive value and Function. Its role and importance

Beverages and Spices-Classification and Importance.

UNIT-V Food toxins, Food Additives, Adulterants, Preservatives, Packaging.

References

1. Meyer L. J.(1989) :Food Chemistry, CBS Publishers And Distributors, New Delhi.
2. Lee Frank A.(1975) :Basic Food Chemistry.-West pot Connect I cut: AVI Publishers.
3. Swaminathan A(1979):Food Science And Experimental Foods, Ganesh And Company Madras,
4. Peckham G. and Free and Graves, G.H.(1979):Foundation Of Food Preparation, Mac Millian Company
5. Griswold, R.M.(1979):The Experimental Study Of Food, Houghton Mifflin 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.
7. Srilakshmi B.(1996):Food Science, New Age International (P) Ltd. Publishers, Wiley Eastern Ltd., New Delhi.
8. Potter, N. and Hotchkiss, J.H.(1996):Food Science, Fifth ed., CBS Publishers and Distributors, New Delhi.
9. Charley M. J(1982): Food Science (2nd Ed), John Wiley And Sons.
10. Belle Lowe (1963): Experimental Cookery, John Wiley And Sons Inc., New York
11. Paul P.C. and Palmer H.H.(1972): Food Theory And Application John Wiley And Sons, London
12. Bennion, Marion And O. Hughes (1986) :Introductory Foods, Ed: Macmillan N.Y.
13. Mahindru, S.N.: Food Additives, Characteristics, Detection And Estimation, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
14. Acharya, K.T.: A Historical Dictionary Of Indian Foods, Oxford Publishing Co.
15. Belitz, H.D. and Grosch W.,(1999):Food Chemistry,(2nd ed), Springer, New York

Human Physiology FSN503MJ

Credits -2 Teaching Hours -30

Course Outcomes-

- 1) To enable the students to understand the functions of various systems in the body.
- 2) To acquaint the students with abnormalities of endocrine system.

UNIT-I

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

Musculoskeletal system: Types of muscle (Skeletal, smooth and cardiac muscles) their properties, Characteristics, structure and function.

UNIT-II

Nervous system: Types Structure and function of brain, spinal cord, neuron

Endocrine system: Endocrine glands- structure, function, role of hormones, regulation of hormonal Secretion

UNIT-III

Digestive system: Introduction and function of digestive system, Salivary gland and its secretion, stomach its 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: 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: 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): Review of Medical Physiology, 12th Edition, Lange Medical Publication.
2. Moran Campell E.J., Dickinson, C.J., Slater, J.D., Edwards, C.R.W. and Sikora, K.(1984): Clinical Physiology,5thEdition,ELBS,BlackwellScientific Publications.
3. Guyton. A.C.(1985):Function of the HumanBody,4thEdition,B.SandersCompany, Philadelphia.
4. Guyton. A.C. and Hall.J.B.(1996): Textbook of Medical Physiology, 9th Edition. W.B. Sanders Company. Prissr Books (Pvt.) Ltd. Bangalore.
5. Wilsion.K.J.W.andWaugh.A(1996):RossandWilsonAnatomyandPhysiologyinHealth and illness. 8thEdition.Churchill Livingstone.
6. Jain.A.K. Textbook of Physiology. Vol I and II. Avichal PublishingCo.NewDelhi8

Practical I FSN-MJP-554
Credits -4 Teaching Hours -120

Course Content

UNIT-I

Estimation of body composition using different methods—

1. Body Composition Analyzer
2. Skin Fold measurement

UNIT-II Calculation of Energy requirements

To calculate BMR using different formulas

To calculate energy expenditure based on physical activities using different methods

UNIT-III Evaluation of protein quality of dishes

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

UNIT-IV

Sensory evaluation of the given samples using descriptive method.

Sensory evaluation of given sample with the help of 'Duo trio test' and prepare

Evaluation card for the same.

Sensory evaluation of given samples using 'Triangle Test' and prepare an evaluation card for the same. To demonstrate the process of sugar re crystallization through the preparation of fondant, *shakkarpara* and fudge.

UNIT-V

To determine the best method of preparing a stable emulsion like mayonnaise.

Unit-V

Preparation of fruit jam and fruit jelly.

To study and detect various adulterants in food stuffs

Semester I: Major Elective Courses (FSN 510 OE to FSN513 OE P)

Food Service Management FSN 510 OE

Credits -2 Teaching Hours -30

Course Outcomes-

- 1) Develop a knowledge 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

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

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

1. **Menu Planning-** Importance, Functions of Menu, Types, Steps in Menu Planning, Designing
2. **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

Food Service Delivery Systems (Centralized and Decentralized) Type of food service systems (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

Quantity food service

Food Service Delivery Systems (Centralized and Decentralized) Type of food service systems (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).

UNIT-IV Organisation of Space and Equipment

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

UNIT-V Financial Management

Book keeping (Single and Double entry system), Books of Accounts, Journal, ledger, trial balance, balance sheet, Type and Behaviour of costs, profit analysis, Records and Controls, Budget, Food cost control methods

Personnel Management and Food Laws Sanitation and Safety in food service industry

References

1. Dennis L. Foster (1995), 'An Introduction to Hospitality', McGraw Hill International
2. Edition.
3. Dennis, R. Lillicrap, John, A. Cousins (1993), "Food and Beverage Service", Older and Stoughten Publishers Ltd, England, IV Edition.
4. Jack D. Ninemeier (1995), 'Food and Beverage Management', 2nd Edition, American Hotel and Motel Association, U.S.A.
5. LendalH.Kotschevar and Richard Donnelly (1993)'Quantity Food Purchasing, McMilan
6. Publishing Co., New York, IV Edition.
7. Mahmood A. Khan,(1987), 'Food Service Operations', AVI, U.S.A.
8. Marian C. Spears(1995), Food Service Organisation', IIIrd Edition, Prentice Hall Inc.,
9. USA
10. MohiniSethi and Surjeet Singh Malhan (1993), 'Catering Management- An Integrated
11. Approach', 2nd Edition, Wiley Publication, Mumbai.
12. Sudhir Andrews (1997), 'Food and Beverage Service- Training Manual', 23rd Reprint, Tata McGraw Hill Publishing Co.
13. West, B Bessie and Wood, Levelle (1988), 'Food Service In Institutions', 6th Edition, Macmillian Publishing C., New York

Food Service Management FSN511 OEP

Credits -2 Teaching Hours -60

Course Content --

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

Nutrition Exercise and Fitness FSN 512 OE

Credits -2 Teaching Hours -30

Course Outcomes:

1. Understand the relationships between physical activity, fitness and health
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.
5. Learn the steps involved in stress management.

UNIT I- Concept of wellness

1. Dimensions of wellness – physical, emotional, intellectual, spiritual and social health
2. Role of other factors in wellness.
 - a. Components of health-related physical fitness – cardio respiratory endurance, muscular strength, muscular endurance flexibility, body composition
 - b. Skill related components of fitness – speed, power, agility, balance

UNIT II- Principles of physical training

1. Specificity, progressive over load, reversibility, individual differences, FITT principle
2. Developing exercise programme, warm up and cool down Cardio respiratory Endurance
3. Review of cardio vascular system
4. Exercise and 3 energy system
5. Benefits of Cardio respiratory endurance exercise
6. Assessing cardio respiratory fitness – ergometry, step test, one mile walk, 12 min walk, 1.5-mile walk
7. Monitoring heart rate
8. Developing a cardio respiratory endurance programme

UNIT III- Muscular strength and Endurance

1. Benefits of muscular strength and endurance
2. Static and Dynamic exercise, Concentric and eccentric contraction
3. Applying FITT principle for developing weight training programme
4. Weight training safety
5. Assessment of muscular strength and endurance hand grip dynamometer 1 RM sit up,

UNIT IV

Flexibility

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** – skin fold measurements, BIA, DEXA–
 - a. Indices – BMI, W/H ratio, broka's index.

UNIT V

Exercise guidelines for life stages –

1. Children, adolescents, pregnant women, geriatric population how often should they do 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

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 V

Stress Management

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, A S C Black, London.
2. Catherine G.R.J. – Nutrition and strength Athlete.
3. Clork N. – Sports Nutrition, Guide book, Leisure Press Campaign.
4. Inge K and 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. Sandhu G.S. and Mann N.S. (2000) – Sports Excellence a Psychological Pursuit, Friends Publication (India).
8. Wolinsky I. (1998), Nutrition in Exercise and Sport, 3rd ed.C R C 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. Smolin L.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. Mc Ardle, William D, Katch, FrankI, Katch, Victor L., (2007)Exercise Physiology, 6th ed.
14. Kansal, Devinder K(1996), Test and Measurement in Sports and Physical Education, DVS Publication.
15. Sharkley, Brian J,(2002), Fitness and Health Human Kinetics, 5th ed.

Nutrition Exercise and Fitness (Pr) FSN513OEP

Credits -2 Teaching Hours -60

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.

UNIT I- Assessment of body composition

1. Need for measuring body structure and composition
2. Somatotyping classification, height – weight tables, skin fold tests, Body mass index, Fat distribution – W/H ratio Assessment of flexibility
3. Need for measuring flexibility
4. Test for flexibility – (i) Sit and reach, (ii) Trunk extension

UNIT II- Assessment of muscular strength and endurance

1. Need for measuring muscular, Strength and endurance
2. Sit up test
3. Push ups
4. Pull ups
5. Dynamometer Assessment of aerobic fitness
6. 1 mile run/1 mile walk
7. 12 min. and 9 min run
8. Unit I- Demonstration of exercise to develop
9. Flexibility
10. Endurance
11. Strength
12. Cardio respiratory fitness

UNIT III: Designing an exercise prescription for adult population

1. Cardiac - 1,3,5
2. Strength – 2,4,6 or combination of both
3. Warm up – actual exercise – cool down

UNIT IV: Planning and preparing

1. Pre event 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, A S C Black, London.
2. Catherine G.R.J. – Nutrition and strength Athlete.
3. Clork N. – Sports Nutrition, Guide book, Leisure Press Campaign.
4. Inge K and 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. Sandhu G.S. and Mann N.S. (2000) – Sports Excellence a Psychological Pursuit, Friends Publication (India).
8. Wolinsky I. (1998), Nutrition in Exercise and Sport, 3rd ed.C R C 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. Smolin L.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. Mc Ardle, William D, Katch, FrankI, Katch, Victor L., (2007)Exercise Physiology, 6th ed.
14. Kansal, Devinder K(1996), Test and Measurement in Sports and Physical Education, DVS Publication.
15. Sharkley, Brian J,(2002), Fitness and Health Human Kinetics, 5th ed.

Research Methodology FSN531 RM

Credits -4 Teaching Hours -60

Course Outcomes

1. Develop a scientific approach and know the processes of research
2. Develop the competence for selecting methods and tools appropriate for research topics
3. Understand concepts of statistical measures of central tendency, dispersion, variability and probability

UNIT-I

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-

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

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

STATISTICAL METHODS AND APPLICATIONS

1. **Descriptive Statistics:** Measure of Central tendency – Mean, Median, Partition values, Mode; Measures of variability – Range, Quartile deviation, Mean deviation, Standard deviation
2. **Measures of Relationship:** Correlation – need and meaning; scatter diagram method, 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-IV

1. **Testing of Hypothesis: Parametric** tests-t-test, ANOVA; Chi-square test -test of independent, goodness of fit; non-Parametric tests – Sign test, Median test, Mann Whitney U test.
2. **Use of Computers in data analysis: Data** compilation, data management, use of statistical packages

REFERENCES

1. Kothari, C.R. (2000): Research Methodology: Methods and Techniques, Wishwa Prakashan, New Delhi.
2. Kumar, A. (1997): Social Research Method (The Art of Scientific Investigation), 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
5. Methodology: An Introduction"
6. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for b

Semester II: Major Core Courses
(FSN551MJ to FSN554MJP)

Nutrition Through Lifecycle FSN551MJ
Credits -4 Teaching Hours -60

Course Outcomes

1. Understand the importance of nutrition and health.
2. Comprehend the basic aspects of meal planning.
3. Obtain knowledge on the nutritional needs pertaining to different stages of life.
4. Plan diet for various age groups.

UNIT-I Nutrition in adolescence

1. Growth and development
2. Physiological and Psychological changes Nutritional requirements of adolescents
3. Health and eating related behavior

Nutrition situation with special needs

1. Pregnancy Eating disorders
2. Obesity–underweight
3. Substance abuse Deficiency conditions
4. Sports and athletics

UNIT-II Nutrition in the adult years

1. Physiological and Psychosocial changes Common nutritional concerns
2. Defensive Nutrition paradigm
3. Nutritional requirements and dietary recommendation.
4. Physical Activity in adulthood

UNIT-III

Nutrition in the adult years

1. Physiological and Psychosocial changes Common nutritional concerns Defensive Nutrition paradigm
2. Nutritional requirements and dietary recommendation.
3. Physical Activity in adulthood

UNIT-IV Nutrition in Aging/Elderly

1. Theories of Aging, Physiological and Psychosocial changes
2. The Aging Process

3. Nutritional requirements of the Elderly Nutrition care

UNIT-V Nutrition needs during illness and chronic conditions

1. Sensory loss Oral health GI functions
2. Neuromuscular and skeletal functions Renal and cardiac function
3. Immuno-competence

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. andHunscher, M.A., (2000)Food, NutritionandDiet Therapy, 14th Edition, W.B. Saunders, London.
9. Antia,F.P. (2005):Clinical Nutrition and Dietetics, Oxford University Press, Delhi.
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.

Therapeutic Nutrition FSN552MJ
Credits -4 Teaching Hours -60

Course Outcomes

1. To provide an overview of the physiology and functions of different organ systems, nutritional care process, the role of a nutritionist and the methods employed in nutrition provision and intervention.
2. To impart in-depth knowledge regarding prevalence, etiology, diagnosis, pathophysiology, drug nutrient interactions, gene – nutrient interactions and medical, nutritional and lifestyle management in different disease conditions.
3. To enable students to focus on advancements in clinical nutrition, emerging modes of therapy and intervention and ongoing research in the field
4. To emphasize the importance of nutrition in the prevention of chronic disease.

UNIT-I

1. Concept of Diet Therapy- Dietetics, Purpose and principles of therapeutic diet. Modification of normal diet. Classification of therapeutic diet.
2. Role of Dietitian- Definition & nutritional care, Assessment of Patient needs based on interrelation of patient data- clinical, biochemical, bio-physical and Personal.
3. Hospital Diets-feeding methods.

RDA for Indians by ICMR, Protein, energy malnutrition

UNIT-II

1. Diet 654 red in fever & infection– types of fever, metabolism in fever, Diet in influenza, typhoid, malaria, tuberculosis
2. Diet in disturbances of GIT- gastritis, small intestine and colon- peptic ulcer, Diarrhea, Constipation, Etiology- Symptom, clinical finding, treatment, dietary modification.

UNIT-III

1. Cardio vascular diseases -acute & chronic diseases of heart, atherosclerosis, plaque formation, hyperlipidemia, Hyperproteinemia, treatment, dietary management.
2. Diet in diseases of liver, gall bladder & pancreas basic hepatic function, etiology, symptoms and dietary management, hepatitis A & B, cirrhosis, of liver & hepatic coma.
3. Diabetes- etiology, classification, sign& symptoms, Insulin, dietary treatment, oral hypoglycemic drugs short & long term complications of diabetes.
4. Diet in Renal diseases-
5. Basic renal function, symptoms & dietary treatment, glomerulonephritis, renal

failure, dialysis, transplantation

6. 7. Diet for hypertension- primary & secondary Role of rennin in hypertension, dietary management, low sodium diet.

UNIT-IV

1. Diabetes- etiology, classification, sign & symptoms, Insulin, dietary treatment, oral hypoglycemic drugs short & long term complications of diabetes.
2. Diet in Renal diseases- basic renal function, symptoms & dietary treatment, glomerulonephritis, renal failure, dialysis, transplantation.
3. Diet for hypertension- primary & secondary Role of rennin in hypertension, dietary management, low sodium diet.

Unit V

1. Nutrition in cancer- Role of diet in cause of cancer metabolic effects of cancer. Cancer cachexia, Impact of radiations and chemotherapies, Nutritional effect of cancer therapy.
2. Diet and drug interaction- effect of drugs on food and nutrient intake ingestion, digestion, absorption, metabolism and requirement. Interaction between nutrient, infections and drugs

References

1. Barrer. K. (2007) *Basic Nutrition Counselling Skill Development* Wadsworth Pub. Co. Bendich. A. (1997) *Preventive Nutrition* Humana Press
2. Blackwell Scientific Publication. (1994). *Manual Of Dietetic Practice*. 2nd ed. British Nutrition Foundation. (1999). *Obesity*. Blackwell Science Pub.
3. Brown. J. (2002). *Nutrition Through The Lifecycle*. Wadsworth Pub Co. Gable. J. (1997) *Counselling skills for Dietitians*, Blackwell Publishing House
4. Garrow. J. S. (1993). *Human Nutrition and Dietetics*, 9th ed., Churchill Livingstone Pub. Gibney, J. M. (2005). *Clinical Nutrition*. Blackwell Publishing House.
5. Gopalan. C. (2000). *Nutritive Value of Indian Foods*. NINICMR Pub.
6. ICMR Pub. (2000). *Nutrient Requirement and Recommended Dietary Allowances for Indians And Dietary Supplements in Disease Management*, Churchill –Livingstone Pub.
7. Jeejeebhoy et al. (1988). *Nutrition and Metabolism in Patient Care* W. B. Saunders CO. King K. (2003). *Nutrition Therapy* 2nd Ed. Texas: Helm Publishing.
8. Lee. R. D. (2003). *Nutritional Assessment* 3rd ed. McGraw Hill Pub. Mahan. K. L. (2008). *Krause's Food and Nutrition Therapy* Saunders Pub.
9. McCormic. D. (1999). *Annual Review of Nutrition* vol 19 & 20. Annual Reviews
10. , California. Peckenpaugh. N. (2003) *Nutrition Essentials and Diet Therapy*. 9th ed.

Saunders Pub Co.

11. Sauberlich. H(1999). *Laboratory TestsfortheAssessmentofNutritionalStatus*2nd ed. CRC Press Scott.A.S. (1997). *Nutrition Support –Theory and Therapeutics*.
12. Chapman and Hall
13. Shills. M.(2006). *Modern Nutrition in Health and Disease*. 10th ed. Lippincot William and Wilkins. Whitney. C. (2006). *Understanding Normal and Clinical Nutrition*.
14. Wads worth publication Zaloga G. (1994). *Nutrition in Critical Care*. Mosby Pub.

Nutritional Biochemistry FSN553MJ

Credits -4 Teaching Hours -60

Course Outcomes

Describe structure, functions and metabolism of macronutrients.

1. Describe hormonal and enzymatic modulators to the metabolism of macronutrients.
2. Describe the biochemistry and metabolism of the macronutrients during different physiological states.
3. List important micronutrients needed as cofactors involved in macronutrient metabolism.
4. Explain the metabolic interrelationship between macronutrients. Have knowledge of current research on nutrition and metabolism

UNIT-I Concept of 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

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

UNIT-III

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

UNIT-IV Lipid Metabolism: Beta-oxidation, Ketone body formation, Lipoproteins –types and metabolism.

Enzymes: Classification, intracellular distribution of enzymes.

Enzymes in clinical diagnosis (ALT, AST, Alkaline Phosphatase)

UNIT-V Hormones: Classification, hormonal control on Carbohydrate, protein & lipid metabolism.

a. Pancreas: Insulin and Glucagon,

Thyroid: T3, T4, Parathyroid, calcitonin

c. 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. and Cox, M.M. (2000): 3rd Ed. Lehninger's Principles of Biochemistry, Macmillan Worth Publishers.
3. Devlin, T.M. (1997): 4th Ed. Textbook of Biochemistry with Clinical Correlations, Wiley Liss Inc
4. Stryer, L. (1998): 4th Ed. Biochemistry, WH Freeman and Co.
5. Conn, E.E., Stumpf, P.K., Bruening, G. and Doi, R. H. (2001): 5th Ed. Outlines of 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). 3rd ed. Micro-Analysis in Medical Biochemistry. J and A Churchill Ltd.
9. Plummer, D.T. (1987). 3rd ed. An Introduction to Practical Biochemistry. McGraw-Hill Book Co

Practical II FSN554MJP
Credits -4 Teaching Hours -120

Course Content

UNIT-I Normal nutrition

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

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

Recipes for weaning foods.

UNIT-II Planning and preparation of diets with modifications in:

- a) Consistency:
- b) Fiber and Residue.
- c) In Diarrhea
- d) For Peptic Ulcer
- e) For Liver diseases.
- f) For Obesity
- g) For fevers and infections
- h) For Insulin and non-insulin dependent diabetes.
- i) For cardiovascular diseases.
- j) For kidney diseases.

UNIT-III

1. **Biochemical Analysis** – Estimation of Hemoglobin
2. **Qualitative Estimation of Carbohydrates:** Identification of glucose, maltose, fructose, estimation of blood
3. **Urine analysis** for urea, glucose, protein

Semester II: Major Elective Courses (FSN560OE to FSN563OEP)

Food Microbiology FSN560OE

Credits -2 Teaching Hours -30

Course Outcomes

- 1. Gain deeper knowledge of microorganism in human environment and understand the importance of microorganism in food technology**
- 2. To develop skills in handling food safety**
- 3. To know the food born disease and how to prevent this**

Course Contents

UNIT I

1. Food Microbiology-Introduction, Definition, Overview
2. Importance of Food Microbiology
3. 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

1. Methods of isolation or detection of micro-organisms or their products in food
 - a. Conventional methods
 - b. Rapid method (Newer techniques)
 - c. Immunological methods-Fluorescent, Antibody, Radio-immunoassay, ELISA etc.
 - d. Chemical methods- Thermo stable, Nuclear, ATP measurement, PCR (Polymer Chain Reactions)- only principles in brief

UNIT III

1. Sources of contamination of food- water, air soil, sewage, animals, during handling and processing
2. General principles underlying spoilage
 - a. Chemical changes due to microbial spoilage
 - b. Spoilage of different groups of food- cereal and cereal products, vegetables and fruits, meat and meat
 - c. products, egg and poultry, fish and other sea foods, sugar, milk and milk products, canned foods.

UNIT IV

1. Role of microbes in fermented food and genetically modified foods, malt, bread, beverages, vinegar, fermented vegetables, fermented dairy products, tea and coffee. Single cell protein, fats, amino acids, and enzymes from micro-organisms.
2. Food preservation- Physical methods. Chemical preservatives and natural anti-microbial compounds. Food borne diseases- infections and intoxications. Bacterial and viral food borne disorders. Mycotoxins.

UNIT V

1. Food sanitation- Microbiology in food plant sanitation, bacteriology of water, sewage and waste treatment and disposal.
2. Indicators of food safety and quality- microbiological criteria of food and their significance

HACCP system and food safety used in controlling microbiological hazards. Food control and enforcement agencies. Microbiological standards

Food Microbiology FSN561OEP

Credits -2 Teaching Hours -60

UNIT I

Preparation of common lab media and special media for cultivation of bacteria, yeasts and moulds

UNIT-II

Staining and identification of bacteria (gram staining, acid-fast, spore, capsule), yeasts and moulds

UNIT-III

Cultivation and identification of importance mold and yeasts (slides and mound culture)

UNIT-IV

Isolation of micro-organisms

UNIT-V

Bacteriological analysis of processed and unprocessed foods

UNIT-VI

Bacteriological analysis of water and milk

Public Health Nutrition FSN562OE

Credits -2 Teaching Hours -30

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

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

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

UNIT III: Assessment of nutritional status in community setting

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

Prevalence, Clinical signs, Classification, Aetiology Prevention and Control of–

- a) Protein Energy Malnutrition
- b) Vitamin A Deficiency
- c) Anemia
- d) Iodine Deficiency Disorders
- e) Zinc Deficiency
- f) Fluorosis

UNIT V: Nutrition Education

Definition, Significance, Planning and Implementation of Nutrition and Health Education

Programme. Theories of Nutrition Education, Evaluation-Purpose and Types.

UNIT VI: Nutrition related Non-Communicable Disorders

Changing trends in lifestyle. Nutrition transition. Risk factors for diet related NCDs-Coronary Heart Diseases, Obesity, Diabetes mellitus, Metabolic Syndrome, Cancer

UNITVII: 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 Woodhead Publishing India, Part I & II.

Public Health Nutrition FSN563OEP

Credits -2 Teaching Hours -60

Course Content

UNIT I. Techniques of nutritional assessment

- A) Anthropometry – Height, weight, MUAC, BMI, WHR
- B) Diet survey - 3 day weighment and 24 hour recall
- C) Clinical assessment
- D) Biochemical Assessment

UNIT II Techniques of growth monitoring

Use and interpretation of Growth Charts

UNIT III-Planning/ preparation of Nutritive recipes

- a) Low-cost recipes
- b) Cyclic menu
- c) One dish meal

UNIT IV Field Study

Assessment of nutritional status of a specific demographic group using direct parameters

UNIT V Field Placement

- a) Formulating messages for Nutrition and Health Education
 - b) Development of audio- visual aids for Nutrition and Health Education
- Planning, implementation and evaluation of a Nutrition and Health Education programme

MAJOR COMPULSARY COURSE

- INTERNSHIP/ON-JOB-TRAINING: FSN581OJT

4 credits

Course Outcomes-:

- Internship is a phase of training wherein 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.
 - 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.
 - Gain skill in planning therapeutic diets
 - Ability to be a health professional
 - Apply the knowledge for diet counseling
 - Competent to manage catering outlet
 - Period of Internship:
Two-month internship in a multispecialty hospital with dietary department. Food Industry and NGO working with Malnutrition Project
 - Case Studies:
Five to ten case studies of different disease conditions have to be taken up during the internship.
 - Report to be submitted in the hospital ,Industry ,NGO and institute(College)
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