UNIVERSITY OF DELHI

Department of Home Science

Faculty of Science

Post Graduate Programmes

Course Credit Structure-CBCS

2018

The **Department of Home Science** offers the following Post Graduate Programmes:

Masters Programmes in –

M.Sc. Food & Nutrition

M.Sc. Human Development & Childhood Studies

M.Sc. Development Communication & Extension

M.Sc. Resource Management & Design Application

M.Sc. Fabric & Apparel Science

Post Graduate Diploma Programmes in-

Post Graduate Diploma in Dietetics & Public Health Nutrition

Post Graduate Diploma in Health and Social Gerontology

PG Admission Eligibility

PART I Candidates seeking admission through entrance examination

8 A	**M.Sc. course in Food & Nutrition:**	**Intake Capacity: 21**
	B.Sc. (Hons.) in Home Science / B.Sc. (Pass) in Home Science / B.Sc (Hons.) in Food Technology: after (10+2)/ PGDDPHN (1 yr), from Delhi University or any other University whose Examination is recognized by the University of Delhi as equivalent and fulfill other conditions of eligibility. Should have passed Nutritional Biochemistry and any two subjects in the following areas: Food & Nutrition / Nutrition through the life cycle / Public Nutrition / Food Science and Processing / Diet therapy / Microbiology/ Nutrition for Adults and Elderly/ Nutrition for Children and Adolescents	ELIGIBILITY CONDITIONS 55% or above marks in aggregate in Home Science or Food Technology or equivalent grade points.
8 B	**M.Sc. course in Human Development and Childhood Studies:**	**Intake Capacity: 11**
	B.Sc. (Hons.) in Home Science / B.Sc. (Pass) in Home Science: after (10+2), from Delhi University or any other University whose Examination is recognized by the University of Delhi as equivalent and fulfill other conditions of eligibility. Should have passed any three subjects in the following areas: Introduction to Human Development / Socio-cultural Dimensions of family in India / Foundations of Human Development: Theories and Principles / Gender Empowerment and Justice / Human Development: Lifespan / Child Rights & Social Action	*ELIGIBILITY CONDITIONS* 55% or above marks in aggregate in Home Science or equivalent grade points.
8 C	**M.Sc. course in Resource Management and Design Application:**	**Intake Capacity: 11**
	B.Sc. (Hons.) in Home Science / B.Sc. (Pass) in Home Science: after (10+2) from Delhi University or any other University whose Examination is recognized by the University of Delhi as equivalent and fulfill other conditions of eligibility. Should have passed any three subjects in the following areas: Resource Management / Family Finance & Consumer Studies / Housing and Space Design / Ergonomic in Design Development /Interior Design and Decoration/ Entrepreneurship and Enterprise Management / Resources and Sustainable Development / Human Resource Management	*ELIGIBILITY CONDITIONS* 55% or above marks in aggregate in Home Science or equivalent grade points.

8 D	**M.Sc. course in Development Communication and Extension:**	**Intake Capacity: 11**
	B.Sc. (Hons.) in Home Science / B.Sc. (Pass) in Home Science: after (10+2) from Delhi University or any other University whose Examination is recognized by the University of Delhi as equivalent and fulfill other conditions of eligibility. Should have passed any three subjects in the following areas: Communication and Extension / Gender and Development / Media Systems / Mass Communication / Sustainable Development/ Training and Development/Extension Programme Design and Management/ Development Communication and Journalism / Training and Development	*ELIGIBILITY CONDITIONS* 55% or above marks in aggregate in Home Science or equivalent grade points.
8 E	**M.Sc. course in Fabric and Apparel Science:**	**Intake Capacity: 19**
	B.Sc. (Hons.) in Home Science / B.Sc. (Pass) in Home Science: after (10+2) from Delhi University or any other University whose Examination is recognized by the University of Delhi as equivalent and fulfill other conditions of eligibility. Should have passed any three subjects in the following areas: Fundamentals of Fabric and Apparel Science / Fabric Science / Indian Textile Heritage / Apparel Construction / Applied Textile Design / Dyeing and Printing / Design Concepts / Fashion Design Development / Fashion Studies	*ELIGIBILITY CONDITIONS* 55% or above marks in aggregate in Home Science or equivalent grade points.

PART II (FORM B) Candidates seeking admission on merit on the basis of marks obtained in the B.Sc. (Hons) Home Science, University of Delhi in the year in which admission is sought

7 A	**M.Sc. course in Food & Nutrition:**	**Intake Capacity: 20**
	B.Sc. (Hons.) in Home Science: Food & Nutrition (3 years course) after (10+2) from Delhi University only.	ELIGIBILITY CONDITIONS 60% or above marks in aggregate or equivalent grade points in Home Science (Hons.) with specialization in Food and Nutrition
7 B	**M.Sc. course in Human Development and Childhood Studies:**	**Intake Capacity: 11**
	B.Sc. (Hons.) in Home Science: Human Development (3 years course) after (10+2) from Delhi University only.	*ELIGIBILITY CONDITIONS* 60% or above marks in aggregate or equivalent grade points in Home Science (Hons.) with specialization in Human Development

7 C	**M.Sc. course in Resource Management and Design Application:**	**Intake Capacity: 11**
	B.Sc. (Hons.) in Home Science: Resource Management (3 years course) after (10+2) from Delhi University only.	*ELIGIBILITY CONDITIONS* 60% or above marks in aggregate or equivalent grade points in Home Science (Hons.)with specialization in Resource Management
7 D	**M.Sc. course in Development Communication and Extension:**	**Intake Capacity: 11**
	B.Sc. (Hons.) in Home Science: Communication and Extension (3 years course) after (10+2) from Delhi University only.	*ELIGIBILITY CONDITIONS* 60% or above marks in aggregate or equivalent grade points in Home Science (Hons.) with specialization in Communication and Extension
7 E	**M.Sc. course in Fabric and Apparel Science:**	**Intake Capacity: 18**
	B.Sc. (Hons.) in Home Science: Fabric and Apparel Science (3 years course) after (10+2) from Delhi University only.	*ELIGIBILITY CONDITIONS* 60% or above marks in aggregate or equivalent grade points in Home Science (Hons.) with specialization in Fabric and Apparel Science

Eligibility for reserved categories will be as per University guidelines.

For details concerning University guidelines visit www.du.ac.in

M.Sc. FOOD AND NUTRITION

Department of Home Science

University of Delhi

Course Credit Structure-CBCS

2018

Introduction:

The Department of Home Science offers M.Sc. Food and Nutrition. The programme is offered in three areas of specialization namely, Clinical Nutrition, Public Health Nutrition and Food Science and Processing. The programme endeavors to train a cadre of professionals who can create nutrition awareness for promotion of healthy lifestyle among the population. The courses of this programme have been designed to enhance the core competency of students in the fields of public health nutrition, dietetics and food science. The curriculum provides a strong theoretical base and also includes experiential learning through field placements and practicals. The programme aims to strengthen the research acumen of students to enable them to develop into academicians and researchers in the field of food science and nutrition.

Programme Specific Objectives:

The objectives of M.Sc. Food and Nutrition programme are:

- To impart the understanding of the concepts of biochemistry, food chemistry and food microbiology
- To enable the students to learn the methods of assessing human nutritional requirements, nutritional assessment and diet planning
- To apply theoretical concepts in laboratory setting as per standard methods in the above mentioned areas
- To understand the applications of nutritional sciences in clinical interventions, communication for health promotion, food service management, food science and processing
- To improve understanding and develop skills for planning, management and monitoring of public health nutrition programmes implemented by the government.
- To acquire skills to undertake systematic research in the area of food science, clinical nutrition and public health nutrition

Programme Specific Outcomes:

The programme trains students to become professionals who can work as public health nutritionists, dieticians and food scientists. After completing this programme the student will be able to:

- Assess nutritional status and plan appropriate diets.
- Use the knowledge of nutritional sciences in clinical interventions and communication for health promotion
- Work as program planners and managers in the field of public health nutrition
- Work as food scientists, quality assurance managers and analysts.
- Manage a food service establishment
- Apply theoretical concepts and practical training for research in the field of food science, clinical nutrition and public health nutrition

COURSE CREDIT SCHEME

Total Credits: 100

Total No. of Core Papers: 15

Total No. of Electives: 05

Total No. of Open Electives: 01

Semester	Core Courses			Elective Course			Open Elective Course			Total Credits
	No. of papers	**Credits (L+T/P)**	**Total Credits**	**No. of papers**	**Credits (L+T/P)**	**Total Credits**	**No. of papers**	**Credits (L+T/P)**	**Total Credits**	
I	4	16 L +4 T/P	20							**20**
II	5	16 L + 8 T/P	24							**24**
III	5	8 L+ 8 P	16	2	8 L + 4 P	12	1	4	4	**32**
IV	1	6	6	3	12 L + 6	18				**24**
Total Credits for the Course			**66**			**30**			**4**	**100**

*** Student must clear 100 credits.**

Semester I				
Core courses	Credits in each core course			
	Theory	Practical	Tutorial	Credits
Core course 1 FNCC 101 Research Methods	4			4
Core course 2 FNCC 102 Advanced Nutritional Biochemistry and Techniques-I	4	2		6
Core course 3 FNCC 103 Principles of Food Science	4	2		6
Core course 4 FNCC 104 Human Physiology	4			4
Total credits in core course	20			
Total credits in Semester I 20				

Semester II				
Core courses	Credits in each core course			
	Theory	Practical	Tutorial	Credits
Core course 5 FNCC 205 Statistics and Computer Application	4	2		6
Core course 6 FNCC 206 Food Microbiology and Food Safety	4	2		6
Core course 7 FNCC 207 Advanced Human Nutrition – I	4			4
Core course8 FNCC 208 Advanced Nutritional Biochemistry and Techniques –II	4			4
Core course 9 FNCC 209 Integrated Nutrition Practical		4		4
Total credits in core course	24			
Total credits in Semester II 24				

Semester III					
Core courses		Credits in each core course			
		Theory	Practical	Tutorial	Credits
Core course 10 FNCC 310 Advanced Human Nutrition- II		4			4
Core course 11 FNCC 311 Clinical Nutrition		4			4
Core course 12 FNCC 312 Integrated practical			4		4
Core course13 FNCC 313 Internship			2		2
Core course 14 FNCC 314 Dissertation I: Technical Writing and Seminar			2		2
Total credits in core course		**16**			
Elective courses*		Credits in each Elective course			
		Theory	Practical	Tutorial	Credits
Group A	Elective course 1	4	2		6
	Elective course 2	4	2		6
Group B	Elective course 1	4	2		6
	Elective course 2	4	2		6
Group C	Elective course 1	4	2		6
	Elective course 2	4	2		6
Total credits in elective courses		**12**			
Number of Open Electives	Credits in each open elective				
	Theory			Credits	
Open Elective	4			4	
Total credits in open elective		**4**			
Total credits in Semester III 32					

***Elective courses for Semester III (Choose two elective papers of one specialization)**

Specialization A: Clinical Nutrition

Elective Course 1: FNEC 31 A: Public Health Aspects of Malnutrition

Elective Course 2: FNEC 32 A: Institutional Food Management

Specialization B: Public Health Nutrition

Elective Course 1: FNEC 31 B: Public Health Nutrition
Elective Course 2: FNEC 32 B: Programme Planning in Public Health Nutrition

Specialization C: Food Science and Processing

Elective Course 1: FNEC 31 C: Principles of Food Processing
Elective Course 2: FNEC 32 C: Food Processing Technology -I

Open Elective Courses for Semester III - Select any one of the following:

- FNOE31 : Community Nutrition Assessment
- HDCSOE31 : Parenting & High Risk Infants
- DCEOE31 : Communication Processes and Techniques
- RMDAOE31 : Entrepreneurship & Innovation
- FASOE31: Fabric Study

Semester IV					
Core courses		Credits in each core course			
		Theory	Practical	Tutorial	Credits
Core course 15 FNCC 415 Dissertation II /Experiential Learning Project			6		6
Total credits in core course		6			
Elective courses**		Credits in each Elective course			
		Theory	Practical	Tutorial	Credits
Group A	Elective Course 3	4	2		6
	Elective Course 4	4	2		6
	Elective Course 5	4	2		6
Group B	Elective Course 3	4	2		6
	Elective Course 4	4	2		6
	Elective Course 5	4	2		6
Group C	Elective Course 3	4	2		6
	Elective Course 4	4	2		6
	Elective Course 5	4	2		6
Total credits in elective courses		18			
Total credits in Semester IV 24					
TOTAL CREDITS IN SEMESTER I/II/III/IV : 100					

****Elective courses for Semester IV (Choose three elective papers of one specialization**)

Specialization A: Clinical Nutrition

Elective Course 3: FNEC 43 A: Advanced Clinical Nutrition
Elective Course 4: FNEC 44 A: Nutrition Communication and Diet Counselling
Elective Course 5: FNEC 45 A: Nutrition for Fitness and Sports

Specialization B: Public Health Nutrition

Elective Course 3: FNEC 43 B: Problems, Policies and Programmes in Public Health Nutrition
Elective Course 4: FNEC 44 B: Nutritional Epidemiology
Elective Course 5: FNEC 45 B: Nutrition Communication for Health Promotion

Specialization C: Food Science and Processing

Elective Course 3: FNEC 43 C: Food Processing Technology -II
Elective Course 4: FNEC 44 C: Advanced Food Science
Elective Course 5: FNEC 45 C: Applied Food Microbiology

SEMESTER I

CC 101: RESEARCH METHODS
THEORY

Marks: 100 **Duration: 3 Hrs.**

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

Course Learning Outcomes:
Student will be able to -

1. Demonstrate knowledge of the scientific method, purpose and approaches to research
2. Compare and contrast quantitative and qualitative research
3. Explain research design and the research cycle
4. Prepare key elements of a research proposal
5. Explain ethical principles, issues and procedures

CONTENTS **PERIODS**

UNIT I: Purpose of Research **10**

- Definition, objectives and significance of research
- Types of research
- Scientific method: induction and deduction
- Research approaches: quantitative, qualitative and mixed
- Issues of relevance and cultural appropriateness

UNIT II: Principles of Research in Quantitative and Qualitative Approaches **30**

Research design

- Meaning and need of research design
- Components and types of research design
- Issues in design construction

Sampling, methods

- Concept of sampling, key differences in the two approaches
- Sampling methods, sample size and sampling error
- Selecting participants and contexts to examine social phenomenon

Data collection and analyses

- Methods and measurement: Measurement in research, scales and errors in measurement , reliability and validity of measurement tools
- Methods of data collection and types of data
- Immersion, deep engagement, triangulation and reflexivity in qualitative data collection
- Data management and quality control
- Transcription in qualitative data analyses
- Errors in inference – Bias and confounding, reliability and validity issues
- Ensuring reliability and validity in qualitative research

UNIT III: The Research Cycle **12**

- Systematic literature review and referencing
- Formulating a research problem –Developing research questions and objectives, exploring research context/phenomenon
- Identifying variables, constructing hypotheses
- Deciding research approach and design
- Selection of sample/participants, choice of methods and analysis.
- Writing a research report-Styles and format.

UNIT IV: Values, Social Responsibility and Ethics in Research **8**

- Ethical principles guiding research: from inception to completion and publication of research
- Ethical issues relating to research participants and the researcher
    - Rights, dignity, privacy and safety of participants
    - Informed consent, confidentiality anonymity of respondents, voluntary participation, harm avoidance
    - Conflicts of interest or bias, Use of inappropriate research methodology, Incorrect reporting, misuse of information

Teaching Plan:

Week 1: Definition, objectives and significance of research
Week 2: Types of research, Scientific method: induction and deduction
Week 3: Research approaches: quantitative, qualitative and mixed. Issues of relevance and cultural appropriateness
Week 4: Meaning and need of research design; types of research design, issues in design construction
Week 5: Concept of sampling, key differences in the two approaches, Selecting participants and contexts to examine social phenomenon
Week 6: Sampling methods, Sample size and sampling error
Week 7: Measurement in research, scales and errors in measurement , reliability and validity of measurement tools
Week 8: Methods of data collection and types of data ,Immersion, deep engagement, triangulation and reflexivity in qualitative data collection
Week 9: Data management and quality control; Transcription in qualitative data analyses
Week 10: Errors in inference – Bias and confounding, reliability and validity issues; Ensuring reliability and validity in qualitative research
Week 11: Research Cycle and writing research report
Week 12: Ethics in Research

Facilitating the achievement of Course Learning Outcomes:

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Demonstrate knowledge of the scientific method, purpose and approaches to	Unit transaction through power point	Assignments, Open book test

	research.	presentations,	
II	Compare and contrast quantitative and qualitative research	Unit transaction through power point presentations and classroom discussion about review and critique of journal articles	Quizzes and objective test
III	Explain research design and the research cycle	Unit transaction through power point presentations and classroom discussion using research case studies	Assignments, Open book test
IV	Prepare key elements of a research proposal	Unit transaction through power point presentations Students to develop a live research project in groups	Assignments, Open book test Assessment of live project
V	Explain ethical principles, issues and procedures	Unit transaction through power point presentations and classroom discussion about research proposals	Class assignments and quizzes

Suggested Readings:

- Aschengrau A, Seage III GR. (2014) *Essentials of Epidemiology in Public Health*. (Third Edition). Sudbury, MA: Jones & Bartlett.
- Bell, J. (1999). *Doing your research project: Guide for first time researchers in social sciences*. New Delhi: Viva Books.
- Bernard, H. R. (2000). *Social research methods: Qualitative and quantitative approaches.* Thousand Oaks, CA.: Sage.
- Blaxter, L. Hughes, C., & Tight, K. (1999). *How to research*. New Delhi: Viva Books.
- Bryman, A. (2008). *Social research method.* Oxford: Oxford University Press.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications.
- Denscombe, M. (1999*). The good research guide for small-scale social research projects*. New Delhi: Viva Publications.
- Denzin, N. and Lincoln, Y. (Eds.) 2005. *The Sage handbook of qualitative research.* London: Sage.

- Kerlinger, F. N, & Lee, H. B. (2000). *Foundations of behavioral research*. Belmont, Calif.: Wadsworth.
- Gordis L. (2013) *Epidemiology.* (Fifth Edition). Philadelphia, PA: Saunders Elsevier
- Miles, M. & Huberman, M. (1994). *Qualitative data analysis: An expanded sourcebook.* London: Sage.
- Rothman K. (2002) *Epidemiology – An Introduction*. New York. NY: Oxford University Press.

FNCC 102: ADVANCED NUTRITIONAL BIOCHEMISTRY AND TECHNIQUES – I
THEORY

Marks: 100 **Duration: 3 Hrs.**

Course Objectives:
The course will acquaint the students with properties and applications of enzymes, give the knowledge on carbohydrate and lipid metabolism, role of hormones in metabolism and impart knowledge on spectrophotometry.

Course Learning Outcomes:
Student will be able to:
1. Understand the enzymes, their types, enzyme activity and their diagnostic role
2. Have coherent and systematic knowledge on carbohydrate metabolic regulation
3. Understand the lipid metabolism and its regulation
4. Correlate the action of hormones with metabolic regulation
5. Learn the principles of spectrophotometry

CONTENTS **PERIODS**

UNIT I: Enzymes **8**
- Classification of enzymes, Cofactor & Prosthetic groups, Concept of active site.
- Effect of pH, temperature, substrate concentration (Km and Vmax, Michaelis-Menten equation) & metal ions on enzyme activity
- Isozyme and Ribozyme
- Application of enzymes in diagnostics (SGPT, SGOT, Creatine kinase & Alkaline phosphatase)

UNIT II: Carbohydrates **12**
- Metabolic regulation of glycolysis, gluconeogenesis, citric acid cycle and glycogen metabolism.
- Pentose phosphate pathway and its significance
- Disorders of carbohydrate metabolism: galactosemia, hereditary fructose intolerance, fructosuria and Glycogen storage disease (Von Gierke, Pompe, Cori and McArdle diseases)

UNIT III: Lipids **14**
- Fatty acids – Synthesis of saturated and unsaturated fatty acids
- Triacylglycerols – Synthesis
- Phospholipids – Synthesis
- Lipoproteins – Types, synthesis, degradation and clinical significance
- Cholesterol – Synthesis and regulation
- Integration of carbohydrate and lipid metabolism

UNIT IV: Biosignaling and Hormones **8**

- Concept of Hormones
- Six types of signaling mechanisms
- Role of insulin, glucagon & epinephrine in intracellular signaling
- Steroid hormones

UNIT V: Spectrophotometric Techniques **6**

- Beer-Lambert's law
- Colorimetry and spectrophotometry
- Atomic absorption spectroscopy
- Flame photometry

Suggested Readings:

- Berg JM, Stryer L, Tymoczko JL and Gatto GJ. (2015) *Biochemistry* 8th ed. W.H. Freeman.
- Devlin TM. (2010) *Text Book of biochemistry with Clinical Correlations* 7th ed. John Wiley and Sons.
- Rodwell VW, Bender DA, Botham KM, Kennelly PJ and Weil PA. (2015) *Harper's Illustrated Biochemistry*. 30th ed. McGraw-Hill. Asia.
- Nelson DL and Cox MM. (2017) *Principles of Biochemistry*. 7th ed. W.H. Freeman.
- Wilson K and Walker J. (2000) *Practical Biochemistry*. 5th ed. Cambridge University Press.

Teaching Plan:

Week 1: Classification of enzymes, Cofactor & Prosthetic group Concept of active site. Effect of pH, temperature & metal ions on enzyme activity

Week 2: Effect of substrate concentration (K_m and V_{max}, Michaelis-Menten equation) Isozyme and Ribozyme, Application of enzymes in diagnostics (SGPT, SGOT, Creatine kinase & Alkaline phosphatase)

Week 3: Metabolic regulation of glycolysis, gluconeogenesis, citric acid cycle and glycogen metabolism-I

Week 4: Metabolic regulation of glycolysis, gluconeogenesis, citric acid cycle and glycogen metabolism-II, Pentose phosphate pathway and its significance

Week 5: Test, Disorders of carbohydrate metabolism: galactosemia, hereditary fructose intolerance, fructosuria and Glycogen storage disease (Von Gierke, Pompe, Cori and McArdle diseases)

Week 6: Fatty acids – Synthesis of saturated and unsaturated, Triacylglycerols – Synthesis

Week 7: Phospholipids – Synthesis, Lipoproteins – Types, synthesis, degradation and significance

Week 8: Cholesterol – Synthesis and regulation; Integration of carbohydrate and lipid metabolism

Week 9: Concept of Hormones, Signalling mechanisms, Test

Week 10: Role of insulin, glucagon & epinephrine in intracellular signalling, Steroid hormones

Week 11: Assignment, Beer-Lambert's law, Colorimetry and spectrophotometry

Week 12: Atomic absorption spectroscopy, Flame photometry

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Classification of enzymes, enzyme activity and diagnostic relevance	Classroom lectures, Experiments on enzyme assay	Short assignment and quiz
II	Metabolic regulation of major carbohydrate metabolic pathways	Classroom lectures, Discussion on important discoveries in metabolism, Practical	Test
III	Lipid metabolism regulation and Lipoproteins	Classroom lectures, short presentations, Practical	Assignment
IV	Mechanisms of hormone signaling	Classroom lectures, short presentations	Test and quiz
V	Principles of Spectrophotometry	Classroom lectures, demonstration on principle and working of spectrophotometer, Practical	Oral and practical test

FNCC 102: ADVANCED NUTRITIONAL BIOCHEMISTRY AND TECHNIQUES – I PRACTICAL

Marks: 50 **Duration: 3 Hrs.**

Course Objectives:

The objective of the course is to acquaint the students with colorimetry in biochemical estimations and give skills on enzyme assays

Course Learning Outcomes:

The student will be able to:

1. Acquire skills on preparation of solutions
2. Colorimetric estimation of biochemical molecules
3. Detect the enzymatic activity

CONTENTS **PERIODS**

UNIT I: Solutions **2**

- Preparation of normal and molar solutions.

UNIT II: Spectrophotometry **7**

- Estimation of Phosphorous
- Estimation of Proteins.
- Estimation of Iron.
- Estimation of Cholesterol.
- Estimation of glucose

UNIT III: Enzyme Assays **3**

- Assay of salivary amylase
- Assay of alkaline phosphatase

Suggested Readings:

- Plummer D. T. (2015). *An Introduction to Practical Biochemistry*. 3rd ed., Tata McGraw Hill
- Wilson K and Walker J. (2000) *Practical Biochemistry*5th ed. Cambridge University Press.

FNCC 103: PRINCIPLES OF FOOD SCIENCE THEORY

Marks: 100 **Duration: 3 Hrs.**

Course Objectives

The course aims to provide systematic knowledge and understanding of chemistry of food components like water, proteins, carbohydrates and lipids, various aspects of food product development and systematic interpretation of sensory evaluation and get an insight in to the additives that are relevant to processed food industry for shelf life extension, processing aids and sensory appeal.

Course Learning Outcomes

The student will be able to understand:

1. Understand the chemistry of food components like proteins, carbohydrates and lipids.
2. Understand basic concepts of new food product development.
3. Enable to learn about the food additives that are relevant to processed food industry for shelf life extension, processing aids and sensory appeal.

CONTENTS **PERIODS**

UNIT I: Food Chemistry **26**

- Water: Definition of water in foods, structure, water activity, phase diagram of water, phase transition of food containing water, interaction of water solute and food compounds, water activity and its influence on quality and stability of foods, methods for stabilization of food systems by control of water activity, sorption isotherm, colloidal properties of foods.

- pH: Hydrogen ion concentration in food, oxidation reduction potential of foods and their applications in food systems.
- Protein: Physical, chemical, nutritional and functional properties and interactions with other food constituents
- Enzymes: Classification, application of enzymes in food industry and immobilized enzymes.
- Sugars: Composition and properties of different types of sugars, their application in food systems, crystallization, caramelization, Maillard reaction and its industrial application. Fondants, fudges and icings etc.
- Lipids: Properties of fats, functional properties of fats and oils, fat stabilizers, fat deterioration and antioxidants, Emulsions such as mayonnaise, interesterification of fats, auto-oxidation of lipids and rancidity

UNIT II: Basic Concepts of New Product Development **8**

- Stages of product development and standardization, sensory evaluation of foods, packaging, labelling and marketing of new food products.

UNIT III: Food Ingredients and Additives **14**

- Food additives- definitions, classification and functions, Preservatives,antioxidants, colours and flavours (synthetic and natural), emulsifiers,sequestrants, humectants, hydrocolloids, sweeteners, acidulants, bufferingsalts, anticaking agents, etc. - chemistry, food uses and functions in formulations; indirect food additives; toxicological evaluation of food additives.

Suggested Readings:

- Branen AL, Davidson PM & Salminen S. (2001) *Food Additives*. 2nd Ed.Marcel Dekker.
- Fellows P J (2002*) Food Processing Technology- Principles and Practices*, 2nd Edition. Woodhead Publishing Ltd.
- Food and Agriculture Organization. (1980*) Manual of Food Quality Control. Additive Contaminants Techniques.* Rome.
- Fuller, G.W. (1999) *New Food Product Development. From concept to market place.* CRC press, New York.
- Mahindru, S N (2000) *Food Additives- Characteristics Detection and Estimation*. Tata Mc Graw Hill Publishing Co. Ltd.
- Peter Murano , *Understanding Food Science and Technology* (with InfoTrac)
- BIS *standards for food products and analysis manual*.
- *Manuals of methods of analysis of various food products*, FSSAI, 2016

Teaching Plan:

Week 1: Water: Definition of water in foods, structure, water activity, phase diagram of water, phase transition of food containing water, interaction of water solute and food compounds, water activity and its influence on quality and stability of foods

Week 2: Methods for stabilization of food systems by control of water activity, sorption isotherm, colloidal properties of foods.

Week 3: pH: Hydrogen ion concentration in food, oxidation reduction potential of foods and their applications in food systems. Protein: Physical, chemical, nutritional and functional properties and interactions with other food constituents

Week 4: Enzymes: Classification, application of enzymes in food industry and immobilized enzymes.

Week 5: Sugars: Composition and properties of different types of sugars, their application in food systems, crystallization, caramelization, Maillard reaction and its industrial application

Week 6: Lipids: Properties of fats, functional properties of fats and oils, fat stabilizers, fat deterioration and antioxidants, interesterification of fats, auto-oxidation of lipids and rancidity

Week 7: Basic concepts of new product development: Stages of product development and standardization

Week 8: Sensory evaluation of foods, packaging, labelling and marketing of new food products.

Week 9: Food additives- definitions, classification and functions: Preservatives, antioxidants

Week 10: Colours and flavours (synthetic and natural), emulsifiers, sequesterants, humectants, hydrocolloids

Week 11: Sweeteners, acidulants, buffering salts, anti- caking agents

Week 12: Chemistry, food uses and functions in formulations; indirect food additives; toxicological evaluation of food additives.

Facilitating the achievement of Course Learning Outcomes

Unit No.	**Course Learning Outcomes**	**Teaching and Learning Activity**	**Assessment Tasks**
I	Imparting knowledge of Food Chemistry and interaction of food components during food processing	Lectures, discussions and visit to processing industry	• Assessment of quality of food ingredient-practical based • Visit report
II	Understanding of stage involved in food product development and their commercialization.	Lectures, discussions based on processing methods used in new product development	• Presentation/quiz • Practical on assessment of quality parameters of new products.
III	Imparting knowledge about use of food ingredients and food additives in food processing industry.	Lectures, discussions based on food additives and their use in different processed food products.	• Presentation • Practical on analysis of different additives used in processed food.

FNCC 103: PRINCIPLES OF FOOD SCIENCE PRACTICAL

Marks: 50 **Duration: 3 Hrs.**

Course Objectives

The aim is to learn quality control of raw and processed food products, physical, chemical and nutritional analysis of commonly consumed raw and processed foods and develop an understanding of estimation of various additives in food.

Course Learning Outcome:

Course Objectives

1. Learn quality control of raw and processed food products
2. Perform physical, chemical and nutritional analysis of commonly consumed raw and processed foods
3. Develop an understanding of estimation of various additives in food

CONTENTS	**PERIODS**
1. Proximate composition of foods: Analysis of carbohydrates, proteins, fats, total ash, moisture content, active alcoholic and aqueous acidity in foods, ascorbic acid/dehydroascorbic acid ratio in foods	**4**
2. Estimation of sugar in foods and reducing properties in honey.	**1**
3. Refractive index, melting point, solidification point of fats & oils.	**1**
4. Determination of peroxide value and acid value in fats & oils.	**2**
5.Estimation of polyphenols in foods.	**1**
6. Analysis of food ingredients and additives	**3**

Suggested Readings:

- Branen AL, Davidson PM & Salminen S. (2001) *Food Additives*. 2nd Ed.Marcel Dekker.
- Fellows P J (2002*) Food Processing Technology- Principles and Practices,* 2nd Edition. Woodhead Publishing Ltd.
- Food and Agriculture Organization. (1980*) Manual of Food Quality Control. Additive Contaminants Techniques.* Rome.
- Fuller, G.W. (1999) *New Food Product Development. From concept to market place.* CRC press, New York.
- Mahindru, S N (2000) *Food Additives- Characteristics Detection and Estimation*. Tata Mc Graw Hill Publishing Co. Ltd.
- Peter Murano (2003)*Understanding Food Science and Technology* (with InfoTrac)
- *BIS standards for food products and analysis manual*.
- *Manuals of methods of analysis of various food products*, FSSAI, 2016

FNCC 104: HUMAN PHYSIOLOGY
THEORY

Marks: 100 **Duration: 3 Hrs.**

Course Objectives:
To understand the normal functioning of various organ systems of the body and their interactions and to be able to comprehend the pathophysiology of commonly occurring diseases

Course Learning Outcomes:
Student will be able to -
1. Understand the current state of knowledge about the functional organization of the human body.
2. Develop insight of normal functioning of all the organ systems of the body and their interactions.
3. Comprehend the pathophysiology of commonly occurring diseases.
4. Correlate physiology with various disorders and their pathogenesis.

CONTENTS **PERIODS**

UNIT I: Blood and Cardio-Thoracic Physiology **20**
- Blood and Plasma Protein -Composition and Function
- Blood formation and factors controlling Erythropoiesis.
- Pathophysiology of Anaemia and Jaundice
- Cardiac cycle, Cardiac output ,Heart sounds
- E.C.G. & its interpretation, Heart rate & regulation
- Blood pressure, Hypertension
- Coronary Artery Disease
- Hemorrhage; Compensatory changes after hemorrhage
- Transport and exchange of gases
- Control of Respiration and Respiratory function tests
- Lung volume & Capacities and COPD

UNIT II: Excretory Physiology and Exercise Physiology **10**
- Urine formation 0
- Renal function tests
- Acid Base balance
- Pathophysiology of Renal Stones, Urinary Tract Infection, Glomerulonephritis
- Concept of Fitness, Adaptations to exercise
- Energy Metabolism in Sports
- Overview of Diet and Physical Performance

UNIT III: Gastrointestinal Physiology **16**
- Functions of Stomach, Liver, Pancreas and Gall Bladder
- Composition ,function and regulation of :
    - Salivary juice
    - Gastric juice
    - Pancreatic juice
    - Bile juice
    - Intestinal juice
- GI hormones

- Pathophysiological overview of some common diseases in relation to Gastrointestinal Tract (Peptic ulcer/GERD, Cholelithiasis, Portal Hypertension, Fatty liver and Liver Cirrhosis

UNIT IV: Neuro-Endocrine and Reproductive Physiology 14

- Overview of organization of nervous system
- Effects of Pituitary, Thyroid, Parathyroid, Adrenal and Pancreatic hormones
- Pathophysiology of Diabetes Mellitus, Metabolic Syndrome, Hashimoto's disease. Tetany and Cushing Syndrome
- Physiology of Menstruation and Menopause
- Physiology of Ageing
- Physiology of Pregnancy, Lactation
- Pathophysiology of PCOD and Infertility

Suggested Readings:

- Ganong W.F.(2003)-*Review of Medical Physiology*.21st ed. McGraw Hill.
- Guyton A.C. and Hall J.E.(2000)*Textbook of Medical Physiology*.10th ed. India: Harcourt Asia..
- Tortora G.J and Grabowski S.R.(2000) *Principles of Anatomy and Physiology*.9th ed. John Wiley and Sons.Inc.
- West J.B.(1996): *Physiological Basis of Medical Practice*.12th Edition. B. I. Waverly Pvt. Ltd.
- Marieb E.N(2001) *Human Anatomy and Physiology*(5th ed)Pearson Education ,Inc, publishing as Benjamin Cummings.
- Jain A. K (2014) Human Physiology for BDS(5th Edition), Publisher: Avichal Publishing Company; ISBN: 9788177394337 .
- Pal G.K and Pal Pravati (2016) *Comprehensive Textbook Of Medical Physiology* (2Vols) Publisher: Jaypee Brothers Medical Pub (P) Ltd.) ISBN: 5551234080758;

Teaching Plan:

Week 1: Blood and Plasma Protein -Composition and Function, Blood formation and factors controlling Erythropoiesis, Pathophysiology of Anaemia and Jaundice

Week 2: Cardiac cycle, Cardiac output ,Heart sounds, E.C.G. & its interpretation, Heart rate & its regulation

Week 3: Blood pressure, Hypertension, Coronary Artery Disease, Hemorrhage, Compensatory changes after hemorrhage

Week 4: Transport and exchange of gases, Control of Respiration and Respiratory function test, Lung volume & Capacities and COPD

Week 5: Urine formation , Renal function tests, Acid Base balance, Pathophysiology of Renal Stones, Urinary Tract Infection, Glomerulonephritis

Week 6: Concept of Fitness, Adaptations to exercise, Energy Metabolism in Sports, Overview of Diet and Physical Performance

Week 7: Functions of Stomach, Liver, Pancreas and Gall Bladder, Composition ,function and regulation of Salivary juice, Gastric juice

Week 8: Pancreatic juice, Bile juice Intestinal juice; GI hormones

Week 9: Pathophysiological overview of some common diseases in relation to Gastrointestinal Tract: Peptic ulcer/GERD, Cholelithiasis, Portal Hypertension, Fatty liver and Liver Cirrhosis

Week 10: Overview of organization of nervous system, Physiology of Ageing

Week 11: Effects of Pituitary, Thyroid, Parathyroid, Adrenal and Pancreatic hormones,

Pathophysiology of Diabetes Mellitus, Metabolic Syndrome, Hashimoto's disease, Tetany and Cushing Syndrome

Week 12: Physiology of Menstruation and Menopause, Physiology of Pregnancy, Lactation Pathophysiology of PCOD and Infertility

SEMESTER II

CC 205: STATISTICS AND COMPUTER APPLICATIONS

THEORY

Marks: 100 **Duration: 3 Hrs.**

Course Objectives:
To understand the basic concepts, theories and methods in statistics, learn basic statistical procedures for research and understand applications of statistical techniques for analysis and interpretation

Course Learning Outcomes
Student will be able to-

1. Differentiate between the qualitative and quantitative methods of analysis of data
2. Suitably apply data reduction strategies and illustrate data using various graphical methods
3. Use appropriate parametric and non-parametric statistical tests
4. Draw conclusions and interpretations from the analysis of data using various statistical softwares

CONTENTS **PERIODS**

UNIT I: Introduction to Statistics **4**
- Basic principles and concepts in statistics
- Orientation to qualitative and quantitative research procedures
- Measurement and computation- Scales of measurement, Reliability and validity

UNIT II: Organisation and Presentation of Data **10**
- Qualitative and quantitative data- Coding & data reduction strategies
- Organisation of Data: Frequency distributions vs. thematic analysis
- Percentage, percentile ranking and frequencies
- Univariate, bivariate and multivariate tables
- Graphic representation: Graphs, diagrams and charts

UNIT III: Descriptive Statistics **6**
- Applications of descriptive statistics
- Measures of Central tendency and Variability

UNIT IV: Probability and Normal Distribution **12**
- Basic principles and applications of probability
- Normal curve
- Characteristics of distributions: Skewness, kurtosis
- Testing hypotheses: Levels of significance and p values
- Errors in hypothesis testing: Type I, Type II
- Sampling distribution
- Standard scores, calculation and application

UNIT V: Statistical Tests **12**

- Concept of parametric and non-parametric tests, statistical tests and level of measurement
- Parametric tests of difference: T test, ANOVA and post hoc analysis of significance
- Parametric tests of association: Pearson's product moment r
- Non-parametric tests of difference: Mann-Whitney, Sign, Median, and Kruskal-Wallis
- Non-parametric tests of association: Spearman's r
- Chi-square test
- Regression and its applications
- Tests for ascertaining reliability of instruments

UNIT VI: Analysis and Interpretation **4**

- Guidelines for selecting an appropriate test
- Interpreting results- Statistical inference
- Research Conclusion and recommendations

Suggested Readings:

- Agresti, A. & Franklin C.A. (2009) Statistics: The Art and Science of Learning from Data (Second Edition) Boston,MA: Pearson Prentice Hall, ISBN 978-0-13-513199-2
- Bernard, H.R. (2000). *Social Research Methods: Qualitative and Quantitative Approaches*. Thousand Oaks, CA: Sage.
- Black, J.A. and Champion, D.J. (1976). *Methods and Issues in Social Research*. New York: John Wiley and Sons.
- Blaxter, L., Hughes, C, and Tight, K. (1999). *How to Research*. New Delhi: Viva books.
- Diez, D. M., Barr, C. D., Cetinkaya-Rundel M. (2015). *OpenIntro Statistics*:((Third Edition). CreateSpace Independent Publishing Platform. ISBN-10: 194345003X, ISBN-13: 978-1943450039 http://www.openintro.org/stat/ textbook.php.
- Elmes, D.G., Kanowitz, B.H. and Roediger, H.L. (1989). *Research Methods in Psychology* (Third Edition). New York: West Publishing Company.
- Fowler, F.J. (1988*). Survey Research Methods. Applied Social Research Methods Series, Vol. 1*. Newbury Park, CA: Sage.
- Greene, S. and Hogan, D. (Eds.). (2005). *Researching Children's Experiences: Methods and Approaches*. London: Sage.
- Gordis L. (2013) *Epidemiology.* (Fifth Edition). Philadelphia, PA: Saunders Elsevier,
- Minium, E. W., King, B. M., & Bear, G. (1995/2004). *Statistical Reasoning for Psychology and Education*. New York: Wiley and Sons.
- Muijs, D. (2004). *Doing Quantitative Research in Education with SPSS*. London: Sage.
- Nigam AK (2016). *Statistical Aspects of Community Health and Nutrition* ,Woodhead Publishing India(WPI)

Teaching Plan:

Week 1: Basic principles and concepts in statistics, Orientation to qualitative and quantitative research procedures, Scales of measurement, Reliability and validity

Week 2: Qualitative and quantitative data- Coding and data reduction strategies,Organisation of Data: Frequency distributions vs. thematic analysis

Week 3: Percentage, percentile ranking and frequencies, Univariate, bivariate and multivariate tables

Week 4: Graphic representation: Graphs, diagrams and charts, Applications of descriptive statistics

Week 5: Measures of Central tendency and Variability
Week 6: Basic principles and applications of probability ,Normal curve
Week 7: Characteristics of distributions: Skewness, kurtosis,Testing hypotheses: Levels of significance and p values
Week 8: Errors in hypothesis testing: Type I, Type II,sampling distributionstandard scores, calculation and application
Week 9: Concept of parametric and non-parametric tests, statistical tests and level of Measurement, Parametric tests of difference: T test, ANOVA and post hoc analysis of significance
Week 10: Parametric tests of association: Pearson's product moment r, Non-parametric tests of difference: Mann-Whitney, Sign, Median, and Kruskal-Wallis
Week 11: Non-parametric tests of association: Spearman's r,Chi-square test,Regression and its applications, Tests for ascertaining reliability of instruments
Week 12: Guidelines for selecting an appropriate test, Interpreting results- Statistical inference, Research Conclusion and recommendations

Facilitating the achievement of Course Learning Outcomes

Unit No.	**Course Learning Outcomes**	**Teaching and Learning Activity**	**Assessment Tasks**
I	Understand the basic concepts, theories and methods in statistics and Differentiate between the qualitative and quantitative methods of analysis of data	Unit transaction through power point presentations,	Assignments, Open book test
II	Suitably apply data reduction strategies and illustrate data using various graphical methods	Unit transaction through power point presentations and classroom discussion	Quizzes and objective test
III	Learn basic statistical procedures for research	Unit transaction through power point presentations and classroom discussion	Assignments, Open book test
IV	Learn basic statistical procedures for research	Unit transaction through power point presentations and classroom discussion	Assignments, Open book test
V	Use appropriate parametric and non-parametric statistical tests	Unit transaction through power point presentations and classroom discussion	Class assignments and quizzes

VI	Draw conclusions and interpretations from the analysis of data	Unit transaction through power point presentations and classroom discussion	Assignments, Open book test

CC 205: STATISTICS AND COMPUTER APPLICATIONS PRACTICAL

Marks: 50 **Duration: 3 Hrs.**

Course Objectives

To understand the basic concepts, theories and methods in statistics, learn basic statistical procedures for research and understand applications of statistical techniques for analysis and interpretation

Course Learning Outcomes:

Student will be able to-

1. Identification of various types of data measurement tools/tests/procedures and understanding the concept of standardisation and reliability and validity.
2. Application of various data reduction and coding methods on quantitative and qualitative data.
3. To be able to organise the data and effectively use appropriate quantitative and qualitative statistical softwares for analysis of data
4. Draw conclusions and interpretations from the analysed data and write reports.

FNCC 206: FOOD MICROBIOLOGY AND FOOD SAFETY THEORY

Marks: 100 **Duration: 3 Hrs.**

Course Objectives:

The course aims to provide theoretical and practical knowledge about the micro-organisms involved in the food spoilage, infections and intoxications. The course also enables to understand the concept of preservation and microbiological safety in various food operations.

Course Learning Outcomes:

Student will be able to -

1. Understand the nature of microorganisms involved in food spoilage, food infections and intoxications.
2. Comprehend principles of various preservation and control techniques.
3. Understand microbial safety in various foods operations.

CONTENTS **PERIODS**

UNIT I: Basic Microbiology **16**

- Introduction to microbiology
- Characteristics of microorganisms
- Factors effecting microbial growth

UNIT II: Food Spoilage and Preservation **16**

- Cultivation of micro-organisms

- Controlling agents for micro-organism
- Food spoilage
- Principles and methods of food preservation

UNIT III: Beneficial Role of Food Microbes in Health **3**

- Importance of normal flora, prebiotics and probiotics
- Fermentation
- Single cell proteins
- Fermented food products

UNIT IV: Food Borne Microbial Diseases **9**

- Public health hazards: Food borne infections and intoxications
- Symptoms, mode of transmission and methods of prevention
- Emerging food pathogens

Unit V: Food Safety and Quality Control **4**

- Indicator micro-organisms
- Concept of Food Safety Management System, GHP and GMP
- HACCP, ISO 22000
- Food Laws, Regulations and Standards

Suggested Readings:

- Frazier, W.C. & Westoff, D.C. (2013*). Food Microbiology. 5th Edition*. Tata McGraw-Hill Publishing Co. Ltd.
- Garbutt, J. (1997). *Essentials of Food Microbiology*. Arnold London.
- Jay, J.M., Loessner, D.A. & Martin, J. (2006). *Modern Food Microbiology. 7thEdition.* Springer
- Banwart, G.J. (2004). *Basic Food Microbiology. 2ndEdition*. CBS Publishers and Distributors, India.
- Pelczar, M.J., Chan, E.C.S., Krieg, N. (1993). *Microbiology. 5thEdition*. Tata McGraw-Hill Publishing Co. Ltd.
- Prescott, L.M., Harley, J.P. & Klein, D.A. (2017). *Microbiology. 10th Edition*. Tata McGraw-Hill Publishing Co. Ltd.
- Mathur, P. (2018). *Food Safety and Quality Control. 1st Edition*. Orient Blackswan Private Ltd. India.
- Forsythe, J.S. (2011). *The Microbiology of Safe Food. 2nd Edition.* Wiley-Blackwell Publishing.
- Ravishashankar, R. & Jamuna, B. (2015). *Microbial Food Safety and Food Preservation*. CRC Press, Boca Raton.
- *Manual of Methods of Analysis of Foods- Microbiological Testing*. (2012). Lab Manual 14. FSSAI, GoI, New Delhi.

Teaching Plan:

Week 1: Introduction to Microbiology
Week 2: Characteristics of Micro-organisms
Week 3: Cultivation of Micro-organisms
Week 4: Controlling agents for Micro-organisms
Week 5: Factors affecting growth of Micro-organisms

Week 6: Food spoilage
Week 7: Methods of food preservation
Week 8: Beneficial role of food microbes
Week 9: Food infection and Intoxication, symptoms and mode of transmission
Week 10: Food borne illnesses
Week 11: Emerging food pathogens
Week 12: Concept of FSMS, HACCP, ISO & National and International food laws and standards

Facilitating the achievement of course learning outcomes

Unit No	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Basic Microbiology	Understand the nature of various groups of micro-organism, their morphology, extrinsic and intrinsic factors affecting their growth.	Simple staining and Differential staining, Assignments and Quizzes
II	Food Spoilage and Preservation	Understand the nature of micro-organism involved in food spoilage	Analysis of Canned product, MBRT, MPN, TPC, Assignments and Quizzes
III	Beneficial role of Food Microbes in Health	Understand the beneficial role of food microbes used for fermentation etc.	Analysis of Curd, Sauerkraut, Probiotic count, Assignments and Quizzes
IV	Food Borne Microbial Diseases	Understand the role of microbes in causing public health hazard due to food contamination	Rapid detection test for pathogens, Swab Test, Ringers Test, Assignments and Quizzes
V	Food Safety and Quality Control	Acquaint with various laws and microbiological standards to be maintained during food processing, FSMS, HACCP, ISO, GMP, FSSAI, CODEX	HACCP plan, Assignments and Quizzes

FNCC 206: FOOD MICROBIOLOGY AND FOOD SAFETY PRACTICAL

Marks: 50 **Duration: 3Hrs**

Course Objectives:

To familiarize with the techniques and methods used for cultivation, purification and identification of microbes

Course Learning Outcomes:

Student will be able to-

1. Understand the morphology and structural features of various micro-organisms.
2. Comprehend various techniques used for isolation, purification, identification and controlling the growth of micro-organisms
3. Assess the microbial safety of personal hygiene, water, milk and other food products.

CONTENTS **PERIODS**

UNIT I: Morphology and Structural Features of Various Micro-organisms **2**

- Simple staining
- Differential staining

UNIT II: Various Techniques and Instruments Used in Microbiology **2**

- Sterilization and Disinfection
- Filtration, biosafety cabinets

UNIT III: Isolation of Microorganisms **3**

- Pure Culture Technique
- Standard Plate Count Method

UNIT IV: Microbiological Analysis For **5**

- Water (Most Probable Number)
- Milk (Methylene Blue Reduction Test)
- Curd and probiotic count
- Adulteration test for various food products.

UNIT V:Biochemical Test **4**

- Rapid detection test
- Phenol co-efficient method
- Zone of Inhibition technique

UNIT VI: HACCP Plan **1**

- HACCP plan for a food process

Suggested Readings:

- Bell, C., Neaves, P. & Williams, A.P. (2005). *Food Microbiology and Lab Practice.* Wiley Press.

- Yousef, A.L. (2003). *Food Microbiology. A Laboratory Manual*. Wiley Inter-Science New Jersey.
- Benson, H.J. (2002). *Microbiological Application.8th Edition.* Tata McGraw Hill.
- Mortimore & Wallace. (2013). *HACCP: A Practical Approach. 3rd Edition*. Springer Publication.
- Cappuccino & Sherman. (2007). *Microbiology: A laboratory Manual. 7th Edition.* Pearson Education Inc.
- Hoorfar, J. (2011). *Rapid Detection, Characterization and Enumeration of Food Borne Pathogens*. American Society for Microbiology, Washington, USA.
- *Drinking Water Specification- Indian Standard. (2012).2nd Revision.* IS 10500:2012. Bureau of Indian Standard, Manak Bhawan, New Delhi, India.
- *Manual of Methods of Analysis of Foods- Microbiological Testing*. (2012). Lab Manual 14. FSSAI, GoI, New Delhi.

FNCC 207: ADVANCED HUMAN NUTRITION -I
THEORY

Marks : 100 **Duration: 3 Hrs**

Course Objectives:

To understand how Dietary Reference Intakes are derived for the population. To appreciate the role of nutrition in cellular and physical growth and assess nutritional status.

Course Learning Outcomes:
After doing this course the student will be able to:
1. Critically evaluate and derive requirements for specific macronutrients.
2. Understand critical periods in growth and development and impact of malnutrition.
3. Assess the nutritional status of children and adults.
4. Appreciate implications of poor dietary and lifestyle practices**.**

CONTENTS **PERIODS**

UNIT I: Human Nutrient Requirements – Macronutrients **18**
- Historical perspective of nutrient requirements
- Methods of assessment of nutrient needs – a critical review
- Critical evaluation of sensitive methods and derivations of requirements and dietary allowances of macronutrients for all age groups:
    - Energy
    - Carbohydrates and dietary fibre
    - Proteins and amino acids
    - Lipids and fatty acids
    - Water
- Critical evaluation of national and international nutrient allowances; factors affecting the requirements.
- Protein quality and its assessment

UNIT II: Growth and Development through the Life Cycle **10**
- Different aspects of growth – cellular to physical

- Determinants of growth and development
- Changes in body composition throughout the life cycle
- Impact of altered nutrition on growth and development
- Maternal malnutrition and pregnancy outcome
- Malnutrition and cognitive development

UNIT III: Assessment of Nutritional Status **10**

- Critical overview of various methods of nutritional assessment – Diet surveys, anthropometric measurements, biochemical and clinical. Rapid methods of assessment
- Analysis and Interpretation of results
- National and International Growth Standards/References, development of WHO Child Growth Standards
- National Nutrition Surveys

UNIT IV: Nutrition Transition **10**

- Changing trends in life style and dietary patterns in population groups and their implications on nutritional status and disease.
- Triple burden of malnutrition
- Improving nutritional quality of diets- fortification, bioavailability of nutrients, dietary diversity, new food basket

Suggested Readings:

- Bamji, M.S., Krishnaswamy K. Brahmam G.N.V. (Eds). (2017). Textbook of Human Nutrition. 4th Edition. New Delhi : Oxford and IBH Publishing Co. Pvt. Ltd.
- Cameron N. (2002). *Human Growth and Development*. USA: Academic Press, Elsevier Science.
- FAO/WHO/UNU (2004). *Human Energy Requirements*. Report of a Joint Expert Consultation. Rome.
- Gibson R S. (2005). *Principles of Nutritional Assessment*. 2nd ed. Oxford University Press.
- ICMR (2010). *Nutrient Requirements and Dietary Allowances for Indians and its revised documents*. New Delhi. ICMR.
- Proceedings of NFI-WHO (SEARO) Symposium. (2006). *Nutrition in Developmental Transition*. New Delhi: NFI.
- Report of a WHO Expert Committee. (1995). *Physical Status: The Use and Interpretation of Anthropometry*. Tech Rep Series 854, Geneva: WHO.
- WHO (2006). *WHO Child Growth Standards*. Geneva : WHO.
- WHO (2006). W*HO Child growth standards: Length/height for age, weight for age, weight for length, weight for height and body mass index.* Available at http:// www.who.int.
- Report of a joint WHO/FAO/UNU expert consultation (2007). *Protein and Amino acid Requirements in Human Nutrition*. WHO Technical Report Series 935. Geneva: WHO.
- WHO (2007). *WHO Reference Data for Children and Adolescents (5-19 years).* Available at http://www.who.int/growthref/en/
- WHO (2009). *WHO Child growth standards: Growth velocity based on weight, length and head circumference.* Available at http://www. who.int

Teaching Plan:

Week 1: Historical perspective of nutrient requirements and definitions, critical overview of methods of assessing requirements, derivation of energy requirements
Week 2: Derivation of requirements of energy, carbohydrates, fibre
Week 3: Derivation of requirements of energy, lipids
Week 4: Derivation of requirements of energy, protein
Week 5: Derivation of requirements of energy, water, protein quality
Week 6: Different aspects of growth – cellular to physical, measurement of growth
Week 7: Determinants of growth and development, changes in body composition through lifecycle and impact of altered nutrition on growth and development
Week 8: Impact of malnutrition on pregnancy outcome and cognitive development, triple burden of malnutrition
Week 9: Critical overview of various methods of nutritional assessment, analysis, interpretation – Diet surveys, anthropometric measurements
Week 10: Critical overview, analysis, interpretation of biochemical and clinical methods, rapid methods of assessment
Week 11: Growth Standards and References, National nutrition surveys, nutrition transition
Week 12: Impact of nutrition transition, improving diet quality

Facilitating the Achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Critically evaluate the methodology and derivation of requirements for specific macronutrients	Discussion, PowerPoint presentations, Videos of methods of assessment	Class Quiz, Assignment
II	Understand critical periods in growth and development and impact of malnutrition	Reading of research on impact of malnutrition on growth, discussion of findings of classical studies, Power Point presentations	Class quiz
III	Assess the nutritional status of children and adults	Power Point presentation, discussion, demonstration of software for analysis of anthropometric data	Presentations by students on sources of data on nutritional status Assignment on formulation of a tool for diet survey
IV	Appreciate implications of poor dietary and lifestyle practices	Power Point presentations, Discussion on nutrition transition	Presentations by students of research papers on nutrition transition and its consequences

FNCC 208: ADVANCED NUTRITIONAL BIOCHEMISTRY AND TECHNIQUES – II
THEORY

Marks: 100 **Duration: 3 Hrs**

Course Objectives:
The aim of the course is to understand the basics of genetic material, get an insight into DNA and RNA metabolism and understand the principles and use of techniques for purification and estimation of DNA and protein

Course Learning Outcomes:
Student will be able to
1. Understand the purine, pyrimidine, iron and heme metabolism
2. Develop insight into structure, functioning and repair of DNA
3. Learn basics of RNA and translation process
4. Comprehend the principles and application of various chromatographic and electrophoretic techniques

UNIT I: Nucleotides, Iron and Heme Metabolism **12**

- Structure of Nucleotides.
- De novo synthesis of purines & pyrimidines nucleotides, regulation and salvage pathways
- Catabolism of purine and pyrimidine nucleotides
- Disorders of purine catabolism (Lesch Nyhan syndrome, Gout, Adenosine deaminase deficiency, Hypouricemia)
- Iron metabolism- Mechanisms of transport and cellular uptake
- Basic concept of Heme biosynthesis and degradation

UNIT II: DNA Organization, Replication and Repair **16**

- Basic structure of DNA
- DNA organization basic, replication and repair
- Regulation of gene expression (lac operon)
- Genetic mutations
- Basic principles in Nutrigenomics

UNIT III: RNA and Protein Synthesis **12**

- Basic structure of RNA
- RNA synthesis and processing (in eukaryotes)
- Genetic code
- Translation
- Post translational modification

UNIT IV: Biochemical Techniques **8**

- Chromatographic Techniques
    - Gel filtration
    - Ion exchange chromatography

    - Affinity Chromatography
    - HPLC
    - Gas Chromatography
- Electrophoretic Techniques
    - Electrophoresis-Polyacrylamide gel electrophoresis (Native and SDS)
    - Agarose gel electrophoresis

Suggested Readings:

- Berg JM, Stryer. L, Tymoczko JL and Gatto, GJ. (2015) *Biochemistry* 8th ed. W.H. Freeman.
- Devlin TM. (2010) *Text Book of biochemistry with Clinical Correlations* 7th ed. John Wiley and Sons.
- Rodwell VW, Bender DA, Botham KM, Kennelly PJ and Weil PA. (2015) *Harper's Illustrated Biochemistry*. 30th ed. McGraw-Hill. Asia.
- Nelson DL and Cox MM. (2017) *Principles of Biochemistry*. 7th ed. W.H. Freeman.
- Wilson K and Walker J. (2000) *Practical Biochemistry*5th ed. Cambridge University Press.

Teaching Plan

Week1: Structure of Nucleotides. De novo synthesis of purines & pyrimidines nucleotides, regulation and salvage pathways-I
Week2: De novo synthesis of purines & pyrimidines nucleotides, regulation and salvage pathways-II; Catabolism of purine nucleotides
Week3: Catabolism of pyrimidine nucleotides; Disorders of purine catabolism (Lesch Nyhan syndrome, Gout, Adenosine deaminase deficiency, Hypouricemia)
Week4: Iron metabolism- Mechanisms of transport and cellular uptake, Basic concept of Heme biosynthesis and degradation
Week5: Test, Basic structure of DNA ; DNA organization, replication and repair
Week6: Regulation of gene expression (lac operon); Genetic mutations
Week7: Basic structure of RNA; RNA synthesis and processing (in eukaryotes); Genetic code
Week8: Translation; Post translational modification
Week9: Basic principles in Nutrigenomics; Gel filtration; Ion exchange chromatography
Week10: Affinity Chromatography; HPLC; Gas Chromatography
Week11:Electrophoresis-Polyacrylamide gel electrophoresis (Native and SDS), Assignment
Week12:Agarose gel electrophoresis, test

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Purine, pyrimidine, iron and heme metabolism	Classroom lectures, Presentations	Test
II	Structural organization, function and repair of DNA	Classroom lectures, Practical	Assignment, Practical test

III	RNA synthesis and processing, Protein translation	Classroom lectures, Practical	Test
IV	Principles and use of chromatography and Electrophoresis	Classroom lectures, Demonstration of instruments	Quiz Assignment

FNCC 209: INTEGRATED NUTRITION PRACTICAL

Marks : 100 **Duration: 3 Hrs**

PART A: ADVANCED NUTRITIONAL BIOCHEMISTRY AND TECHNIQUES – II

Course Objectives:

The aim of the practical is to understand principle and preparation of buffer solutions, understand various methods of quantitative estimations of biomolecules and gain information on various blood analysis tests

Course Learning Outcomes:

Student will be able to

1. Gain skill on preparation of buffers
2. Learn DNA and RNA estimation in solutions
3. Comprehend the application of chromatography and electrophoresis in biochemistry
4. Knowledge on blood analysis

CONTENTS **PERIODS**

UNIT I: Buffers **3**

- Preparation of acidic buffers.
- Preparation of basic buffers

UNIT II: Spectrophotometry **3**

- DNA estimation
- RNA estimation

UNIT III: Chromatographic Techniques **2**

- Separation of amino acids.

UNIT IV: Electrophoresis **2**

- Agarose gel electrophoresis.
- SDS polyacrylamide gel electrophoresis

UNIT IV Blood Analysis **2**

- Survey of pathological laboratory to obtain the information on blood and serum analysis tests.

Suggested Readings:

- Plummer D. T., (2015) *An Introduction to Practical Biochemistry*. 3rd ed., Tata McGraw Hill
- Wilson K and Walker J. (2000) *Practical Biochemistry*5th ed. Cambridge University Press.

PART B: ADVANCED HUMAN NUTRITION

Marks : 50 **Duration: 3 Hrs**

Course Objectives:
To learn techniques of measurement of energy expenditure, protein quality, nutritional status.

Course Learning Outcomes:
After completing this course, the student will be able to:

1. Measure energy expenditure in individuals
2. Assess the protein quality of diets and dishes
3. Assess nutritional status of individuals and groups.

CONTENTS **PERIODS**

UNIT I: Energy Expenditure **3**

- Oxygen consumption measurements / Heart rate measurements.
- Computing energy expenditure and energy balance – minute to minute record, GPAQ.

UNIT II: Assessment of Protein Quality **2**

- Calculation of NDpCal % and PDCAAS of diets and dishes.

UNIT III: Assessment of Nutritional Status **7**

- Dietary surveys – 24 hour recall, Food frequency questionnaire. Standardization of recipes
- Anthropometry – Height, weight, waist circumference, hip circumference, MUAC, skin fold measurements. Analysis of data using WHO AnthroPlus software
- Body composition – bioelectrical impedance method
- Demonstration of cognition tests (to measure intelligence) relevant to the study of nutrition.

UNIT IV: Field Visits **1**

- To institutions conducting research in human nutrition and report writing of the visits

Suggested Readings:

- Cameron N. (1984). *The measurement of Human Growth*. London and Sydney: Croom Helm Ltd.
- Gibson R S. (2005). *Principles of Nutritional Assessment*. 2nd ed. Oxford University Press.
- WHO (2006). *WHO Child growth standards: Length/height for age, weight for age, weight for length, weight for height and body mass index.* Available at http:// www.who.int.
- Report of a joint WHO/FAO/UNU expert consultation (2007). *Protein and Amino acid Requirements in Human Nutrition*. WHO Technical Report Series 935. Geneva: WHO.

- WHO (2007). *WHO Reference Data for Children and Adolescents (5-19 years).* Available at http://www.who.int/growthref/en/
- WHO (2009). *WHO Child growth standards: Growth velocity based on weight, length and head circumference.* Available at http://www. who.int

SEMESTER III

FNCC 310: ADVANCED HUMAN NUTRITION –II
THEORY

Marks : 100 **Duration: 3 Hrs**

Course Objectives:
To understand the basis of derivation of Dietary Reference Intakes for micronutrients and how requirements change under special conditions.

Course Learning Outcomes:
After this course the student should be able to:
1. Critically evaluate the methodology and derivation of requirements for micronutrients.
2. Understand nutritional management in special conditions.
3. Appreciate importance of nutrition immunity interactions and their operational implications.
4. Track emerging concepts in the field of nutrition.

CONTENTS **PERIODS**

UNIT I: **Human Nutrient Requirements -Micronutrients** **22**
Critical evaluation of sensitive methods and derivations of requirements and dietary allowances of micronutrients for all age groups:
- Water soluble vitamins
- Fat soluble vitamins
- Minerals and trace elements
- Critical evaluation of national and international nutrient allowances; factors affecting the requirements.
- Critically evaluate national and international dietary guidelines.

UNIT II: Interactions of Nutrition, Immunity and Infection **8**
- Host defense mechanisms and nutrients essential in the development of immune system.
- Effect of infections on the nutritional status of an individual.
- Nutrient deficiencies and excesses affecting the immuno-competence and to infections.
- Operational implications.

UNIT III: Nutrition in Special Conditions **6**

- Extreme temperatures - low and high
- High altitude
- Space nutrition and food systems
- Introduction to sports nutrition

UNIT IV: Emerging Concepts in Human Nutrition **12**
- Nutrigenomics
- Functional foods and bioactive compounds
- Nutraceuticals
- Genetically modified foods and advances in biotechnology

Suggested Readings:

- Bamji, M.S., Krishnaswamy K. Brahmam G.N.V. (Eds.) (2017). *Textbook of Human Nutrition*. 4th Edition. New Delhi : Oxford and IBH Publishing Co. Pvt. Ltd.
- Chadha R., Mathur P. (Eds.) (2015). *Nutrition: A Lifecycle Approach*. New Delhi: Orient Blackswan
- FAO/WHO. (2004). *Vitamin and Mineral Requirements in Human Nutrition*. Report of a Joint Expert Consultation.
- FSSAI (2016). *Food Safety and Standards (Food or Health Supplements, Nutraceuticals, Foods for Special Dietary Uses, Foods for Special Medical Purpose, Functional Foods and Novel Food) Regulations*. http://www.fssai.gov.in/home/fss-legislation/fss-regulations.html
- ICMR (2010). *Nutrient Requirements and SUGGESTED Dietary Allowances for Indians and its revised documents*. New Delhi. ICMR.
- Simopoulos A.P., Ordovas J.M. (Eds.) (2004). *Nutrigenetics and Nutrigenomics*. USA: Karger

Teaching Plan:

Week 1: Derivation of requirements of thiamine, calcium, selenium
Week 2: Derivation of requirements of riboflavin, iron, magnesium
Week 3: Derivation of requirements of niacin, zinc, iodine, sodium, potassium
Week 4: Derivation of requirements of pyridoxine, other trace minerals
Week 5: Derivation of requirements of folic acid, national and international dietary guidelines
Week 6: Derivation of requirements of vitamin B12, host defence mechanisms, effect of infection on nutritional staus
Week 7: Derivation of requirements of vitamin A, effect of malnutrition on immunity, operational implications
Week 8: Derivation of requirements of vitamins A and D, nutrition in extreme hot, cold locations and high altitude
Week 9: Derivation of requirements of vitamins D and E, space food systems and space nutrition, sports nutrition
Week 10: Derivation of requirements of vitamin K, sports nutrition, nutraceuticals
Week 11: Functional foods, GM foods and other advances in biotechnology
Week 12: Nutrigenomics

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Critically evaluate the methodology and derivation of requirements for specific micronutrients	Discussion, PowerPoint presentations, Videos of methods of assessment	Class Quiz, Assignment
II	Understand nutritional management in special conditions	Reading of research on sports nutrition and derivation of nutrient requirements in special	Class quiz

		conditions, discussion of findings, Power Point presentations, videos of space food systems	
III	Appreciate importance of nutrition immunity interactions and their operational implications	Power Point presentation, discussion on operational implications	Presentations by students on studies linking nutrition to immunity
IV	Track emerging concepts in the field of nutrition	Power Point presentations, Discussion, videos	Presentations by students on research papers linked to the relevant topics

FNCC 311: CLINICAL NUTRITION
THEORY

Marks: 100 **Duration: 3 Hrs**

Course Objectives:
To understand the nutrition assessment, planning, implementation, monitoring and follow up in nutrition care process, the causative factors and metabolic changes in various diseases/disorders and acquire knowledge on the principles of diet therapy and comprehend principles of dietary Counselling and the rationale of prevention of various diseases/disorders.

Course Learning Outcomes:
The student will be able to
1. Understand the importance of nutritional assessment in the care of patients.
2. Gain knowledge about causative factors and metabolic changes in various diseases/disorders and the associated principles of diet therapy.
3. Learn the principles of dietary Counselling.
4. Comprehend the rationale of prevention of various diseases/disorders.

CONTENTS **PERIODS**

UNIT I Nutritional Assessment and Care of Patients **9**

- Nutrition care process
    - Nutritional screening and assessment of
    - patients – out patient & hospitalized
    - Tools for screening
    - Nutritional interpretation of routine medical and laboratory data
    - Nutrition care plan and implementation
    - Monitoring and follow up
    - Ethical issues
- Dietary Counselling
- Nutrition Support: Enteral Nutrition

UNIT II Medical Nutrition Therapy in metabolic diseases **10**

- Diabetes Mellitus – Type 1, Type 2 and Gestational diabetes
- Endocrine disorders – Polycystic ovary disease, thyroid

Unit III Coronary Heart Diseases **5**

- Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications, treatment, MNT,dietary counselling and recent advances in
    - Hypertension, dyslipidemia, Congestive heart failure

Unit IV Gastrointestinal Tract Disorders **8**

- Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications, treatment, MNT, dietary counselling and recent advances in
    - GERD, peptic ulcer, dyspepsia, flatulence,celiac disease, inflammatory bowel disease, diverticular disease, hernia, hemorrhoids, intestinal surgery, bariatric surgery.
    - Nutrition for oral and dental disorders

Unit V Overview of Some Degenerative Disorders **8**

- Cancer – General and specific cancers, effect of cancer therapy on MNT,
- Role of diet in etiology and management
- Chronic Obstructive Pulmonary Disease
- Systemic Lupus Erythematosis
- Nutrition for bone health

Unit VI Pediatric Nutrition **6**

- Inborn errors of metabolism – Phenylketonuria, Galactosemia, Maple Syrup Urine Disease, Glycogen Storage Disease
- Severe Acute Malnutrition
- Cystic fibrosis

Suggested Readings:

- Gibney MJ, Elia M, Ljungqvist &Dowsett J. (2005) *Clinical Nutrition. The Nutrition Society Textbook Series.* Blackwell Publishing Company
- Gibson SR. (2005). *Principles of Nutritional Assessment*. 2nd Edition. Oxford University press
- Joshi YK. *Basics of Clinical Nutrition*. 2nd Edition. Jaypee Brothers Medical Publishers.
- Lee RD & Neiman DC. (2009). *Nutritional Assessment*. 5th Edition. Brown & Benchmark.
- Mahan, L. K. and Escott Stump. S. (2016) *Krause's Food & Nutrition Therapy* 14th ed. Saunders-Elsevier
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease*. 10th ed. Lipincott, William and Wilkins.
- Williams, S.R. (2001) *Basic Nutrition and Diet Therapy*. 11th ed. Times Mirror Mosby College Publishing
- World Cancer Research Fund & American Institute for Cancer Research (2007) *Food, Nutrition, Physical Activity and the Prevention of Cancer- A Global Perspective.* Washington E.D. WCRF.

Teaching Plan:

Week 1: Nutrition care process and steps of NCP
Week 2: Ethical issues, Dietary Counselling
Week 3: Enteral Nutrition, Medical Nutrition Therapy in Diabetes Mellitus – Type 1, Type 2

Week 4: Medical Nutrition Therapy in Gestational diabetes Endocrine disorders – Polycystic ovary disease, thyroid
Week 5: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Hypertension, dyslipidemia
Week 6: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Congestive heart failure
Week 7: Etiopathophysiology, metabolic & clinical aberrations, diagnosis,Complications and recent advances in prevention, treatment, MNT and dietary Counselling in GERD, peptic ulcer, dyspepsia, flatulence
Week 8 : Etiopathophysiology, metabolic & clinical aberrations, diagnosis,Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Inflammatory bowel disease, diverticular disease, hernia, hemorrhoids
Week 9: Complications and MNT and dietary Counselling inIntestinal surgery, bariatric surgeryNutrition for oral and dental disorder, Cancer – General and specific cancers, effect of cancer therapy on MNT, Role of diet in etiology and management
Week 11: Chronic Obstructive Pulmonary Disease, Systemic Lupus Erythematosis, Nutrition for bone health
Week 12 : Inborn errors of metabolism – Phenylketonuria, Galactosemia, Maple Syrup Urine Disease, Glycogen Storage Disease, Severe Acute Malnutrition, Cystic fibrosis

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the importance of nutritional assessment in the care of patients.	Discussion	Assignment on nutritional assessment and care of patients.
II	Gain knowledge about causative factors and metabolic changes in various diseases/disorders and the associated principles of diet therapy.	Discussion	Assignment on etiology, pathophysiology and metabolic changes in various disorders Diet plan for management of diseases.
III	Learn principles of dietary counselling	Discussion	Practice interactive session on dietary counselling
IV	Comprehend the rationale of prevention of various diseases/disorders	Discussion	Assignment on role of diet in prevention and management of these disorders

FNCC 312: INTEGRATED PRACTICAL

Maximum Marks: 100 **Duration: 3 Hrs**

PART A: ADVANCED HUMAN NUTRITION

Course Objectives:

To learn techniques in nutrient analysis of foods and assessment of micronutrient status.

Course Learning Outcomes:

1. Understand how requirements are derived using sensitive methods like nutrient balance studies and load tests
2. Analyze nutrients in foods and biological fluids like urine
3. Recognize clinical symptoms of deficiency and excess
4. Appreciate research done in the field of nutrition

CONTENTS **PERIODS**

UNIT I: Human Balance Studies **4**

- Nitrogen balance.
- Mineral balance: Ca/Fe/Zn.

UNIT II: Estimation of Micronutrient Status **5**

- Iodine in salt and urine
- Carotenoids/phytochemicals in fruits/vegetables
- Estimation of iron content of a food
- Load test of Vitamin C
- Clinical assessment of micronutrient status

UNIT III: Exposure to Research in Human Nutrition **3**

- Field visits to institutions conducting research in human nutrition and report
- Writing of the visits
- Critical review of original research articles

Suggested Readings:

- Ranganna S. (1986). Handbook of Analysis and Quality Control of Fruit and Vegetable Products. New Delhi: Tata McGraw-Hill Education.
- Raghuramulu N., Madhavan Nair K., Kalyanasundaram S.(2003). *A Manual of Laboratory Techniques*. Hyderabad: National Institute of Nutrition

PART –B CLINICAL NUTRITION

Course Objectives:

To enable students to plan and prepare suitable therapeutic diets based on patient needs, provide dietary counselling for prevention/ treatment of various diseases/ disorders and familiarize with special therapeutic/ health foods

Course Learning Outcomes:

Student will be able to:

1. Assess the needs of patients.

2. Plan and prepare diets suitable for patients of different diseases
3. Comprehend types and availability of foods for special dietary uses.

CONTENTS **PERIODS**

Unit I: Assessment of patient needs – nutritional assessment and screening **2**

- Recording of BP by using a Sphygmomanometer
- Use of Pulse Oximeter
- Use of Glucometer
- Interpretation of OGTT, HbA1c values
- Interpretation of RFT and LFT

Unit II: Planning and preparation of diets for following diseases **9**

- Type 1 diabetes
- Type 2 diabetes
- Gestational Diabetes
- Peptic ulcer
- Hypertension and dyslipidemia
- Congestive heart failure
- Ulcerative colitis
- Diverticular disease
- Cancer
- IEM and SAM
- Antenatal clinic, high risk pregnancy

Unit III: Market Survey of the Following Products **1**

- Food supplements
- Enteral formulas
- Functional foods
- Disease specific foods

Suggested Readings:

- Gibney MJ, Elia M, Ljungqvist &Dowsett J. (2005) *Clinical Nutrition. The Nutrition Society Textbook Series*. Blackwell Publishing Company
- Gibson SR. (2005). *Principles of Nutritional Assessment*. 2nd Edition. Oxford University press
- Joshi YK. *Basics of Clinical Nutrition*. 2nd Edition. Jaypee Brothers Medical Publishers.
- Lee RD & Neiman DC. (2009). *Nutritional Assessment*. 5th edition. Brown & Benchmark.
- Mahan, L. K. and Escott Stump. S. (2016) *Krause's Food & Nutrition Therapy* 14th ed. Saunders-Elsevier
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease*. 10th ed. Lipincott, William and Wilkins.
- Williams, S.R. (2001) *Basic Nutrition and Diet Therapy*. 11th ed. Times Mirror Mosby College Publishing

- World Cancer Research Fund & American Institute for Cancer Research (2007) Food, Nutrition, Physical Activity and the Prevention of Cancer- A Global Perspective. Washington E.D. WCRF.

FNCC 313: INTERNSHIP

(To be assessed by a Board of three teachers)

Marks: 50

Course Objectives:

To gain hands on experience of working in various institutions related to the area of Food and Nutrition.

The students could work with NGOs / Government agencies / International agencies/ Hospitals / Food Industries etc. They would be required to present are a report of their Internship in their Department.

FNCC 314: DISSERTATION- I: TECHNICAL WRITING & SEMINAR

(Seminar to be assessed by three teachers)
(Technical writing to be assessed by Continuous Evaluation)

Marks : 50

Course Objectives:

To understand the nuances of scientific writing, develop skills in collation and presentation of scientific information and learn the process of developing a research proposal/ project proposal

Course Learning Outcomes:

Student will be able to:

1. Demonstrate knowledge of scientific writing method and styles
2. Develop a research design on a topic relevant to their field
3. Prepare a systematic literature review on a select topic
4. Present a seminar of the literature review

CONTENTS **PERIODS**

The practical will have three components. Based on option of students for either dissertation or project work, due emphasis will be provided

A) Research Design / Project proposal **12**

- Under the guidance of supervisor allocated prepare a research design / project proposal

B) Skills in Technical Writing **24**

- Learn the nuances of select technical writing styles/ guides
- Analyze technical posters of researches in the fields

- Analyze dissertations, research reports systematic reviews/ secondary research and project evaluation reports and their presentations

C) Review of Literature & Seminar **12**

- Prepare a literature review on a select topic using an approved style guide
- Conduct Plagiarism check of document prepared
- Present an oral seminar on the topic

Facilitating the achievement of Course Learning Outcomes

Unit No.	**Course Learning Outcomes**	**Teaching and Learning Activity**	**Assessment Tasks**
I	Demonstrate knowledge of scientific writing method and styles	Students oriented the nuances of select technical writing styles/ guides Analyze technical posters of researches in the fields Analyze dissertations, research reports and project evaluation reports Videos on scientific writing shown	Quiz and exercises will be given to students
II	Develop a research design on a topic relevant to their field	Along with allocated supervisors students will work on deciding a topic of research, review literature and develop an appropriate research design	Students submit the research design to technical review board for review and comments
III	Prepare a systematic literature review on a select topic	Students collate the literature review done about their research topic selected and prepare a document based on it. Students review old seminar documents and critique their presentation	Students literature review document reviewed by seminar committee Plagiarism test done of final document
IV	Present a Seminar based on the literature review done	Students watch videos of seminar presentations and critique them. Prepare a seminar presentation.	Students presentations evaluated by the departmental seminar committee

Suggested Readings:

- Alley, M. (2018) *The Craft of Scientific Writing*. New York: Springer.
- Bernard, H.R. (2000). *Social Research Methods: Qualitative and Quantitative Approaches*. Thousand Oaks, CA: Sage
- Black, J.A. and Champion, D.J. (1976). *Methods and Issues in Social Research*. NewYork: John Wiley and Sons.
- Blaxter, L., Hughes, C, and Tight, K. (1999). *How to Research*. New Delhi: Viva books.
- Blum, D., Knudson M., and Henig, R. M. (2005) *Field Guide for Science Writers: The Official Guide of the National Association of Science Writers*. USA; Oxford University Press. http://www.nasw.org/field-guide
- Elmes, D.G., Kanowitz, B.H. and Roediger, H.L. (1989). *Research Methods in Psychology (Third Edition)*. New York: West Publishing Company.
- Katz, M. (2009) *From Research to Manuscript: A Guide to Scientific Writing* (2nd Ed). New York : Springer
- http://www.apastyle.org/
- http://www.citethisforme.com/guides

ELECTIVE PAPERS

GROUP –A

FNEC 31 A: PUBLIC HEALTH ASPECTS OF MALNUTRITION
THEORY

Maximum Marks: 100 **Duration: 3 Hrs**

Course Objectives:

This Course will familiarize the students with the concepts of Public Health aspects of malnutrition- both under-nutrition and over-nutrition, health care of the community, and food and nutrition security. The students will acquire knowledge about the causes, consequences and preventive strategies for nutritional problems in the community and also strategies for improving the nutritional and health status of communities.

Course Learning Outcomes:

Student will be able to

1. Become familiar with the concept of public health aspects of malnutrition and health care of the community.
2. Understand the causes, consequences and preventive strategies for nutritional problems in the community.
3. Comprehend the strategies for improving nutrition and health status of communities.
4. Acquire knowledge about the concept of food and nutrition security and the various programmes for improving food and nutrition security.

CONTENTS **PERIODS**

UNIT I: Public Health Nutrition and Health Care Systems **8**

- Aim, scope and content of Public Health Nutrition
- Role of Public Health Nutritionist in national development
- Health – definition, dimensions, determinants and indicators
- Health care of the community

- Health care systems, ICDS, Rural Development (National Rural Livelihood Mission, Panchayat Raj Institutions)

UNIT II: Public Health Aspects of Undernutrition 10

- Etiology, public health implications, preventive strategies for CED/PEM, Severe Acute Malnutrition, major micronutrient deficiencies (Vitamin A Deficiency, Nutritional Anemias, Iodine Deficiency Disorders, Vitamin D Deficiency and Osteoporosis, Zinc Deficiency) and emerging nutrient deficiencies of public health significance
- Maternal/Reproductive health, Adolescent Nutrition and Anemia
- National strategies and programmes for prevention of malnutrition

Unit III: Epidemiology: Basic Concepts, Methods and Applications 12

- Introduction and overview to epidemiology
- Epidemiologic study methods- observational and experimental studies
- Epidemiology of non-communicable diseases
- Demographic, epidemiological and social determinants of NCD's and their mapping: Cardiovascular diseases and Type 2 diabetes, Cancer, Respiratory diseases (COPD and asthma) and other emerging issues and ongoing challenges of non-communicable diseases
- Public health strategies for prevention of NCD's: Policies, programmes, taxation and pricing, improving built environment3

Unit IV: Approaches/ Strategies for Improving Nutrition and Health Status of the Community 10

- Health based interventions including immunization, provision of safe drinking water/ sanitation, prevention and management of diarrhoeal diseases and National Policies to address sanitation
- Food based interventions including food fortification, dietary diversification, supplementary feeding and biotechnological approaches
- Education based interventions including growth monitoring and promotion (GMP), health / nutrition related behaviour change communication

UNIT V: Food and Nutrition Security 8

- Concepts and definitions of food and nutrition security at national, household and individual levels.
- Public Sector programmes for improving of food and nutrition security and POSHAN *Abhiyaan*

Suggested Readings:

- Gibney M J, Margetts B M, Kearney J M Arab (IstEds) (2004) *Public Health Nutritio*n, NS Blackwell Publishing
- Gopalan C (Ed) (1987) *Combating Under nutrition- Basic Issues and Practical Approaches*, Nutrition Foundation of India
- Kaufman M (2007) *Nutrition in promoting the public health strategies, principles and practices*. Jones and Barlett Publishers
- Park K (24th ed) (2017) *Park's Textbook of Preventive and Social Medicine*, Jabalpur M/s. BanarsidasBhanot
- ICMR (NIN) Dietary Guidelines for Indians (2nd ed) (2011) *Dietary Guidelines for Indians: A manual.*
- IFCT (2017) *Indian food composition table*, NIN

- Ross A C (Eds) (2012) *Nutrition in health and disease*, Lippincott Williams & Wilkins
- Shils M E (Eds) (1998) *Nutrition in health and disease*, Lippincott Williams & Wilkins
- NNM: http://www.icds-wcd.nic.in/nnm/home.html
- Vir S (2011) *Public health nutrition in developing countries,* Woodhead Publishing India limited
- Bonita, R., Beaglehole, R., Kjellström T. (2006) *Basic Epidemiology*, 2nd Edition, WHO, 2006 http://whqlibdoc.who.int/publications/2006/9241547073_eng.pdf
- Moon, G., Gould, M. (2000). *Epidemiology: An Introduction*. Philadelphia, Open University Press
- Langseth L. (1996). *Nutritional Epidemiology: Possibilities and Limitations*. Washington DC, ILSI Press.
- Gordis L. *Epidemiology*. 5th ed. Philadelphia, PA: Saunders Elsevier, 2013
- Aschengrau A., Seage G.R. (2014) *Essentials of Epidemiology in Public Health*. 3rd ed. Sudbury, MA: Jones & Bartlett.
- Willett, W. (2013) *Monographs in Epidemiology and Biostatistics*, Third Edition, Oxford University Press.

Teaching Plan:

Week 1: Concept of public health nutrition, Aim, scope and content of Public Health Nutrition, Role of Public Health Nutritionist in National development, Health - definition, dimensions

Week 2: Health - determinants and indicators, Health care of the community, Health care systems

Week 3: Etiology, public health implications, preventive strategies for CED/PEM, Severe Acute Malnutrition

Week 4: Etiology, public health implications, preventive strategies for micronutrient deficiencies of public health significance

Week 5: National strategies and programmes for prevention of malnutrition. Introduction and overview to epidemiology.

Week 6: Epidemiology of non-communicable diseases. Demographic, Epidemiological and social determinants of NCD's: Cardiovascular diseases and Type 2 diabetes, Cancer, Respiratory diseases (COPD and asthma) and otheremerging issues and ongoing challenges of non-communicable diseases

Week 7: Demographic, Epidemiological and social determinants of NCD's: Cardiovascular diseases and Type 2 diabetes, Cancer, Respiratory diseases (COPD and asthma) and otheremerging issues and ongoing challenges of non-communicable diseases

Week 8: Public health strategies for prevention of NCD's: Policies, programmes, taxation and pricing, improving built environment

Week 9: Health based interventions including immunization, provision of safe drinking water/ sanitation, prevention and management of diarrhoeal diseases. Food based interventions including food fortification

Week 10: Food based interventions including food fortification, dietary diversification, supplementary feeding and biotechnological approaches. Education based interventions - nutrition related behaviour change communication,

Week 11: Concepts and definitions of food and nutrition security at national, household and individual levels

Week 12: Public Sector programmes for improving of food and nutrition security, POSHAN *Abhiyaan*

Facilitating the Achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching And Learning Activity	Assessment Tasks
I	Become familiar with the concept of public health nutrition and health care of the community.	Lecture-cum-Discussion	Assignment/ Test/ Quiz
II	Understand the causes, consequences and preventive strategies for nutritional problems in the community.	Lecture-cum-Discussion, Presentations	Student presentations/ Assignment/ Test
III	Comprehend the strategies for improving the nutrition and health status of communities.	Lecture-cum-Discussion, Presentations	Student presentations/ Assignment/ Test
IV	Understanding the basic concepts, methods and applications of Epidemiology with ref to NCD's	Lecture-cum-Discussion, presentations	Student presentations/ Assignment/ Test
V	Acquire knowledge about the concept of food and nutrition security and the various programmes for improving food and nutrition security	Lecture-cum-Discussion, presentations	Student presentations/ Assignment/ Test

FNEC 31 A: PUBLIC HEALTH ASPECTS OF MALNUTRITION PRACTICAL

Maximum Marks: 50 **Duration: 3 Hrs**

Course Objectives:

To develop nutrition education programmes for vulnerable groups and planning nutritious recipes for micronutrient deficiencies and field visit to ongoing national nutrition and health programmes.

Course Learning Outcome:

Student will be able to develop nutrition education programmes for vulnerable groups and plan nutritious recipes for micronutrient deficiencies.

CONTENTS **PERIODS**

Unit-I **4**

- Development of a plan for conducting nutrition education programmes in the community.
- Preparation of communication aids for different groups

Unit-II **3**

- Development of low cost recipes for infants, preschoolers, adolescents, pregnant and lactating mothers

Unit-III **5**

- Planning and preparation of diet/ dishes for Protein Energy Malnutrition (PEM), Vitamin A Deficiency (VAD), Iron Deficiency Anaemia (IDA), obesity, hypertension, diabetes
- Field visits to ongoing national nutrition and health programmes

Suggested Readings:

- Chadha R , Mathur P (2015) *Nutrition A life cycle Approach*, Orient Black Swan Pvt. Ltd, Lady Irwin College
- Dietary Guidelines for Indians (2nd ed) (2011) *Dietary Guidelines for Indians: A manual*., NIN
- IFCT (2017) *Indian Food Composition Tables*, NIN
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (4th ed) (2010) *Basic food preparation*, Lady Irwin College
- Khanna, K, Gupta, S, Sethi, R, Mahna, R, Rekhi, T, 2004. *The Art and science of cooking-A Practical Manual*. Elite Publishing House Pvt. Ltd.
- Bonita, R., Beaglehole, R., Kjellström T. (2006) *Basic Epidemiology*, 2nd Edition, WHO, 2006 http://whqlibdoc.who.int/publications/2006/9241547073_eng.pdf
- Moon, G., Gould, M. (2000). *Epidemiology: An Introduction*. Philadelphia, Open University Press
- Langseth L. (1996). *Nutritional Epidemiology: Possibilities and Limitations*. Washington DC, ILSI Press.
- Gordis L. *Epidemiology*. 5th ed. Philadelphia, PA: Saunders Elsevier, 2013
- Aschengrau A., Seage G.R. (2014) *Essentials of Epidemiology in Public Health*. 3rd ed. Sudbury, MA: Jones & Bartlett.
- Willett, W. (2013) *Monographs in Epidemiology and Biostatistics*, Third Edition, Oxford University Press.
- Park, K. (2017) *Park's Textbook of Preventive and Social Medicine*, 24th ed. Jabalpur M/s. Banarsidas Bhanot

FNEC 32 A: INSTITUTIONAL FOOD MANAGEMENT
THEORY

Marks : 100 **Duration: 3 Hrs**

Course Objectives:

To develop a knowledge base about the facilities required for different types of food service units and to equip individuals in understanding and managing resources in a food service institution

Course Learning Outcomes:

Student will be able to:

1. Gain expertise to function as a food service manager.
2. Develop knowledge in managing various food service systems.
3. Understand and manage resources in a food service institution.
4. Provide practical experience in managing food material for food service management

UNIT I: Managing Catering Processes **9**

- Approaches to management
- Classical, Scientific, Systems approach, Management by Objective, Just-in Time, Total Quality Management, Quality of Work Life
- Tools of Management
- Tangible Tools: Organization chart, Job description, Job specification, Job analysis: Path way chart, Process chart, Work schedule, Production schedule, Staff and service analysis, Budget
- Intangible tools: Communication, Leadership, Decision making

UNIT II: Food Production Cycle in Various Food Service Institutions **7**

- Meal Ordering System (manual, electronic)
- Menu construction (hospital, canteen, MDM, food stall)
- Menu card/ display
- Food production processes for various situations
- Guidelines of regulatory bodies

UNIT III: Managing Resources **24**

- Manpower
- Functions of a personnel manager, absenteeism, labour turnover
- Recruitment and selection process - Process and Sources-Internal and External, Process interview, Tests
- Orientation and Training- Importance of orientation and training, content of programme, Steps of developing an Orientation programme, Types of training - OJT, Group; continuous training, training for development, Developing a training programme
- Appraisal of employees – Importance, Methods, Limitation
- Motivating employees- Motivation theories and approaches -Content theories: Maslow, Herzberg, McClelland; Process theories: Vroom, Equity; Reinforcement theory; Techniques of motivating employees
- Employee behavior and policies
- Finance and Marketing
- Managing finances in a catering establishment
- Records: Menu, Purchase, Store, Production, Sales, Personnel, Utilities
- Reports :Cost analysis: Concept of Trial Balance, Profit and Loss Account
- Marketing techniques and strategies
- Equipment and Layouts
- Types of equipment
- Steps in layout planning and architectural features
- Feasibility assessment in terms of layout planning

UNIT IV. Food Safety, Hygiene and Regulations in Food Service Institutions **8**

- HACCP
- Good Manufacturing Practices (GMP),Good Hygiene Practices (GHP)
- Food Safety and Standards Regulations
- Food safety in different food service units
- Accreditations for healthcare systems: NABH, JCI

Suggested Readings:

- West B Bessie & Wood Levelle (1988) *Food Service in Institutions* 6th Edition Revised By Hargar FV, Shuggart SG, & Palgne Palacio June, Macmillian Publishing Company New York.
- Sethi Mohini (2005) *Institution Food Management*. New Age International Publishers
- Kazarian E A (1977) *Food Service facilities Planning* 3rd Edition Von Nostrand Reinhold New York.
- Kotas Richard & Jayawardardene. C (1994) *Profitable Food and Beverage Management* Hodder & Stoughton Publications
- Kotler Philip. (2001) *Marketing management*Millennium Edition Prentice Hall of India
- Taneja S and Gupta SL (2001) *Entrepreneurship development*, Galgotia Publishing
- Dessler Gary (2007) *Human Resource Management* 11th edition Prentice Hall New Jersey
- Luthans Fred (2004) *Organisational Behaviour* 10th Edition Mc Graw Hill International

Teaching Plan:

Week 1: Classical, Scientific, Systems approach, Management by Objectives, Just-in Time, Total Quality Management, Quality of Work Life, Tools of management (Introduction)

Week 2: Tools of management: Tangible Tools: Organization chart, Job description, Job specification, Job analysis: Path way chart, Process chart, Work schedule, Production schedule, Staff and service analysis, Budget

Week 3: Intangible tools: communication, leadership, decision making, food production cycle in various institutions: meal ordering system (manual, electronic)

Week4: Food production cycle in various institutions: Meal ordering system, menu construction (hospital, canteen, MDM, food stall), menu card/ display, food production processes for various situations

Week 5: Food production cycle in various institutions: Guidelines of regulatory bodies, Managing Resources: Functions of a personnel manager, absenteeism, labour turnover Recruitment and selection process - Process and Sources-Internal and External, Process interview, Tests

Week 6: Manpower: Orientation and Training- Importance of orientation and training, content of programme, Steps of developing an Orientation programme, Types of training - OJT, Group; continuous training, training for development, Developing a training programme ; Appraisal of employees – Importance, Methods, Limitation

Week 7: Manpower: Motivating employees- Motivation theories and approaches -Content theories: Maslow, Herzberg, McClelland; Process theories: Vroom, Equity; Reinforcement theory; Techniques of motivating employees; Employee behavior and policies

Week 8: Finance and Marketing: Managing finances in a catering establishment Records: Menu, Purchase, Store, Production, Sales, Personnel, and Utilities

Week 9: Finance and Marketing: Reports: Cost analysis: Concept of Trial Balance, Profit and Loss Account, Marketing techniques and strategies

Week 10: Equipment and Layouts: Types of equipment, Steps in layout planning and architectural features

Week 11: Equipment and Layouts: Feasibility assessment in terms of layout planning Food safety, hygiene and regulations in food service institutions: HACCP, Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP), FSSA 2006

Week 12: Food safety, hygiene and regulations in food service institutions: Food safety in different food service units. Accreditations for healthcare systems: NABH, JCI

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Develop insight about basic concept of catering management	Discussion	Assignment on various theories of management
II	Understand manage food service in healthcare	Discussion, visits to healthcare system	Report of the visits
III	Understand resource management in a food service unit	Discussion	Assignment on collecting information on various resources in management
IV	Develop insight of new laws and regulation in food safety for food service units	Discussions	Assignment

FNEC 32 A: INSTITUTIONAL FOOD MANAGEMENT PRACTICAL

Marks: 50 **Duration: 3 Hrs.**

Course Objectives

To develop skills in menu planning, quantity food production for various food service organizations within specific budgets

Course Learning Outcomes

Student will be able to

1. Understand the operations of food service units.
2. Develop insight about products and their price in market.
3. Develop skills in planning menus for various food service organizations within specific budgets.
4. Application of acquired skills in menu planning and quantity food production

CONTENTS **PERIODS**

Unit I: Market Survey **1**

- Food products raw and processed in different kind of markets

Unit II: Planning Menus for the following: **5**

- Conference
- Food stall
- Mid Day Meal
- Cyclic menu for hospital (government/private)

Unit III: Standardizing Recipes in Quantity Cooking **6**

- Canteen project/ Event catering
- Development of sale promotion tool
- Training Food service unit personnel in hygiene and sanitation

Suggested Readings:

- West B Bessie & Wood Levelle (1988) *Food Service in Institutions* 6th Edition Revised By Hargar FV, Shuggart SG, & Palgne Palacio June, Macmillian Publishing Company New York.
- Sethi Mohini (2005) *Institution Food Management*. New Age International Publishers
- Kazarian E A (1977) *Food Service facilities Planning*. 3rd Edition Von Nostrand Reinhold New York.
- Kotas Richard & Jayawardardene. C (1994) *Profitable Food and Beverage Management*. Hodder & Stoughton Publications
- Taneja S and Gupta SL (2001) *Entrepreneurship Development,* Galgotia Publishing

FNEC 31 B: PUBLIC HEALTH NUTRITION
THEORY

Marks: 100 **Duration: 3 Hrs.**

Course Objectives:

The course will familiarize the students with understanding of the concept of public health nutrition and the national health care delivery system, the current concerns in public health nutrition and the strategies for improving the nutritional status of the communities. The course will also orient students towards concept of food and nutrition security and critical appraisal of the current scenario.

Course Learning Outcomes:

Students will be able to:

1. Understand the concept and current concerns of Public Health Nutrition.
2. Comprehend the National Health Care Delivery System.
3. Get exposed to population dynamics and economics of malnutrition and how it impacts national development
4. Understand the causes and consequences of nutritional problems in the community.
5. Be familiar with the concept of food and nutrition security.

CONTENTS **PERIODS**

UNIT I: Public Health Nutrition and Health Care System **14**

- Aim, scope and content of public health nutrition
- Current concerns in public health nutrition: An overview
- Role of public health nutritionists in national development
  - Health - definition, dimensions, determinants, indicators
  - Community health care
- National Health Care Delivery System, ICDS, Rural Development (National Rural Livelihood Mission), Panchayat Raj Institutions

UNIT II: Population Dynamics **6**

- Demographic transition

- Population structure: Implications on quality of life
- Population Policy

Unit III: Economics of Malnutrition **4**

- Health Economics and Economics of Malnutrition
- Impact of malnutrition on productivity and national development

Unit IV: **Approaches for Improving Nutrition and Health Status of the Community** **16**

- Health based interventions including immunization, provision of safe drinking water/ sanitation, prevention and management of diarrhoeal diseases. Other health services such as antenatal care, de-worming, pharmaceutical supplements (IFA,VAS etc)
- Food based interventions including food fortification, dietary diversification, supplementary feeding and biotechnological approaches.
- Education based interventions including growth monitoring and promotion (GMP), health / nutrition related social and behaviour change communication.

Unit V: Food and Nutrition Security **8**

- Concepts and definitions of food and nutrition security at national, regional, household and individual levels
- Impact of food production losses, distribution, access, availability, consumption on food and nutrition security- critical appraisal of the current scenario
- POSHAN *Abhiyaan*

Suggested Readings:

- Achaya, K.T. (Ed) (1984) *Interface Between Agriculture, Nutrition and Food Science*, The United National University.
- Beaton, G. H and Bengoa, J. M. (Eds) (1996) *Nutrition in Preventive Medicine*, WHO.
- Gibney M.J., Margetts, B.M., Kearney, J. M. Arab, I. (Eds) (2004) *Public Health Nutrition*, NS Blackwell Publishing.
- Gopalan, C. (Ed) (1987) *Combating Under nutrition – Basic Issues and Practical Approaches*, Nutrition Foundation of India.
- Kaufman, M. (2007) *Nutrition in promoting the public health strategies, principles and practice*, Jones and Bartlett Publishers.
- Park, K. (2017) *Park's Textbook of Preventive and Social Medicine*, 24th ed. Jabalpur M/s. Banarsidas Bhanot.
- Vir, S. (2011),*Public health nutrition in developing countries Part-1 & 2*. Woodhead Publishing India limited.
- WHO (2006).*WHO Child growth standards: Length/height for age, weight for age, weight for length, weight for height and body mass index* (2006). Available at http:// www.who.int.
- WHO (2009). *WHO Child growth standards: Growth velocity based on weight, length and head circumference* Available at http://www. who.int
- WHO (2007). *WHO Reference Data for Children and Adolescents (5-19 years).* WHO

Teaching Plan

Week 1: Aim, scope and content of public health nutrition, Current concerns in public health nutrition: An overview

Week 2: Role of public health nutritionists in national development Health - definition, dimensions, determinants, indicator

Week 3: Community health care: Concept, levels of health care: primary, secondary, tertiary level care, Primary health care
Week 4: National Health Care Delivery System Demographic transition
Week 5: Population structure: Implications on quality of life Population Policy
Week 6: Health Economics and Economics of Malnutrition, Impact of malnutrition on productivity and national development
Week 7: Health based interventions including immunization, provision of safe drinking water/sanitation, prevention and management of diarrhoeal diseases
Week 8: Food based interventions including fortification, use of biotechnology, supplementary feeding
Week 9: Education based interventions including growth monitoring and promotion, communication for health and nutrition behaviour change
Week 10: Education based interventions including growth monitoring and promotion, communication for health and nutrition behaviour change
Week 11: Concepts and definitions of food and nutrition security at national, regional, household and individual levels
Week 12: Impact of food production losses, distribution, access, availability, consumption on food and nutrition security- critical appraisal of the current scenario

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the concept and current concerns of Public Health Nutrition.	Presentations, Discussion	Test on the topic
II	Comprehend the National Health Care Delivery System.	Presentations, Discussion	Individual Assignments
III	Get exposed to population dynamics and economics of malnutrition and how it impacts national development	Presentations, Discussion,	Group presentation
IV	Understand the causes and consequences of nutritional problems in the community.	Presentations, Discussion,	Individual Assignments for different nutritional problems
V	Be familiar with the concept of food and nutrition security.	Presentations, Discussion	Test on knowledge domain, Individual Assignment

FNEC 31 B: PUBLIC HEALTH NUTRITION PRACTICAL

Marks: 50 **Duration: 3 Hrs.**

Course Objectives:
The aim of the course is to plan and prepare low cost nutritious dishes and cyclic menus for vulnerable groups, understand the national health care delivery system and identify type of nutritional problems and their determinants in different population groups.

Course Learning Outcomes:

The students will:
1. Develop low cost standardized recipes for different age groups and physiological states.
2. Prepare cyclic menus for feeding programmes and institutions.
3. Identify nutritional problems in the community and their determinants.

CONTENTS **PERIODS**

Unit I: Development of low cost recipes for infants, preschoolers, elementary school children, adolescents, pregnant and lactating mothers. Standardization and demonstration of any one recipe. **4**

UNIT II: Planning and preparation of cyclic menu for a school feeding programme **3**

Unit III: Field visit to Primary Health Centre/ANC / Ongoing nutrition and health programmes 1

Unit IV: Identification of the type of nutritional problems and their determinants in different population groups based on National/regional level Nutrition and Health Surveys- Secondary data analysis 4

Suggested Readings:

- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (4th ed) (2010) *Basic food preparation*, Lady Irwin College.
- Dietary Guidelines for Indians (2011). *Dietary Guidelines for Indians: A manual*. Second edition, NIN
- IFCT (2017). *Indian Food Composition Tables*, NIN.
- Khanna, K, Gupta, S, Sethi, R, Mahna, R, Rekhi, T, 2004. *The Art and science of cooking- A Practical Manual*. Elite Publishing House Pvt. Ltd.

FNEC 32 B: PROGRAMME PLANNING IN PUBLIC HEALTH NUTRITION THEORY

Marks: 100 **Duration: 3 hours**

Course Objectives:

This course will make the students familiar with the process of planning and management of public health nutrition programmes. It will help them understand the concept of monitoring of programmes and nutritional surveillance. The students will also learn about nutrition in emergency and disaster situations.

Course Learning Outcomes:

The students will:

1. Become familiar with the process of planning and management of public health nutrition programmes.
2. Develop an understanding of the concept of nutrition monitoring and nutrition surveillance.
3. Get acquainted with the nutritional problems during emergencies/ disasters and the strategies to tackle them.

CONTENTS **PERIODS**

Unit I: Programme Planning and Management in Public Health Nutrition **14**

- Introduction to Management Principles
- Basic principles and models of programme planning
- Planning process in public health nutrition - community needs assessment, setting goals and objectives, selecting indicators, selecting interventions, planning for programme implementation and resources, planning for programme monitoring and evaluation, planning for programme termination, stakeholder participation in programme management
- Planning at micro and macro level

Unit II: Programme Monitoring and Evaluation **12**

- Definition, significance and purpose of monitoring food/nutrition programmes
- Identification and selection of indicators for monitoring, data collection and analysis system (e.g. MIS)
- Definition, significance and purpose of evaluation of food/nutrition programmes
- Principles of evaluation, types, models and steps of evaluation
- Identification and selection of indicators for evaluation
- Strategies for data collection - qualitative and quantitative

Unit III: Nutrition Surveillance **10**

- Objectives, initial assessment indicators for use in nutrition surveillance
- Nutritional surveillance for programme planning: Triple A approach
- Current programme monitoring systems in India

Unit IV: Nutrition in Emergencies and Disasters **12**

- Natural and manmade disasters resulting in emergency situations
- Nutritional problems in emergencies in vulnerable groups
- Macro / micronutrient deficiencies
- Infections
- Assessment and surveillance of affected population groups – clinical, anthropometric and dietary
- Nutritional relief and rehabilitation – assessment of food needs, food distribution strategies, mass/supplementary feeding, hygiene and sanitation, evaluation of feeding programmes
- Public nutrition approaches to tackle nutritional problems in emergencies

Suggested Readings:

- Boyle M.A. (2016*). Community Nutrition in Action: An Entrepreneurial Approach*. 7th Edition. Brooks Cole.
- Edelstein S. (2010) *Nutrition in Public Health: A handbook for developing programmes and services*. Third Edition. Jones and Bartlett Learning.
- FAO. (1983) *Selecting Interventions for Nutrition Improvement. A Manual*. Nutrition in Agriculture.No. 3.
- Gibney M.J., Margetts, B.M., Kearney, J.M., Arab, L. (Eds) (2004) *Public Health Nutrition*.NS Blackwell Publishing.
- Vir, S.C. (Ed.). (2011). *Public Health Nutrition in Developing Countries*. Part 2. Woodhead Publishing India.
- WHO. (2000). *The management of nutrition in major emergencies*.

Teaching Plan

Week 1: Concept of management, its importance. Introduction to Management Principles

Week 2: Basic principles and models of programme planning. Planning process in public health nutrition, community needs assessment, setting goals and objectives, selecting indicators

Week 3: Planning process in public health nutrition, selecting interventions, planning for programme implementation and resources, planning for programme monitoring and evaluation,

Week 4: Planning process in public health nutrition: planning for programme termination, stakeholder participation in programme management. Definition, significance and purpose of monitoring food/nutrition programmes. Identification and selection of indicators for monitoring, data collection and analysis system

Week 5: Definition, significance and purpose of evaluation of food/nutrition programmes
Principles of evaluation, types, models and steps of evaluation

Week 6: Identification and selection of indicators for evaluation. Strategies for data collection - qualitative and quantitative

Week 7: Strategies for data collection – quantitative objectives, initial assessment indicators for use in nutrition surveillance

Week 8: Nutritional surveillance for programme planning: Triple A approach

Week 9: Current programme monitoring systems in India

Week 10: Natural and manmade disasters resulting in emergency situations
Nutritional problems in emergencies in vulnerable groups - Macro / micro
Nutrient deficiencies, Infections

Week 11: Assessment and surveillance of affected population groups – clinical, anthropometric and dietary
Nutritional relief and rehabilitation – assessment of food needs, food distribution strategies, mass/supplementary feeding, hygiene and sanitation, evaluation of feeding programmes

Week 12: Nutritional relief and rehabilitation – assessment of food needs, food distribution strategies, mass/supplementary feeding, hygiene and sanitation, evaluation of feeding programmes, Public nutrition approaches to tackle nutritional problems in emergencies

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Become familiar with the process of planning and management of public health nutrition programmes.	Lecture-cum-Discussion	Assignment/ Test
II & III	Develop an understanding of the concept of nutrition monitoring and nutrition surveillance.	Lecture-cum-Discussion	Assignment/ Test
IV	Get acquainted with the nutritional problems during emergencies/ disasters and the strategies to tackle them.	Lecture-cum-Discussion	Assignment/ Test/ Student Presentations

FNEC 32 B: PROGRAMME PLANNING IN PUBLIC HEALTH NUTRITION PRACTICAL

Maximum Marks: 50 **Duration: 3 Hrs**

Course Objectives:
The course aims to enable the students to understand methods of assessing the health and nutrition needs of the community and design action plans to address the nutrition problems.

Course Learning Outcomes:
The students will be able to:
1. Assess the health and nutrition needs of the community.
2. Acquire skills to design an action plan for addressing a public health nutrition problem in the community.

CONTENTS **PERIODS**

Unit-I **2**

- Assessment of needs of the public health nutrition problems in an identified community.

Unit-II **10**

- Designing a suitable action plan for a public health nutrition programme for the identified community.

Suggested Readings:

- Boyle M.A. (2016). *Community Nutrition in Action: An Entrepreneurial Approach*. 7th Edition. Brooks Cole.
- Edelstein S. (2010) *Nutrition in Public Health: A handbook for developing programmes and services*. Third Edition. Jones and Bartlett Learning.

- FAO. (1983) *Selecting Interventions for Nutrition Improvement. A Manual*. Nutrition in Agriculture.No. 3.
- Gibney M.J., Margetts, B.M., Kearney, J.M., Arab, L. (Eds) (2004) *Public Health Nutrition*.NS Blackwell Publishing.
- Vir, S.C. (Ed.). (2011). *Public Health Nutrition in Developing Countries*. Part 2. Woodhead Publishing India.

FNEC 31 C: PRINCIPLES OF FOOD PROCESSING
THEORY

Maximum Marks: 100 **Duration: 3 hrs**

Course Objective:
To acquaint with properties of foods and basic principle of Food Engineering and its processes, along with the unit operations.

Course Learning outcome:
Student will be able to
1. Understand the basic concepts of properties of foods and basic food engineering concepts
2. Acquire the knowledge of various unit operations in food processing.
3. Gain the knowledge of food packaging and its interaction with food products.

Unit I: Properties of Foods and Processing **20**
- Properties of liquid, solid and gases, material transfer, fluid flow, heat transfer, effect of processing on sensory characteristics of foods.

Unit II: Unit operations in food processing **20**
- Cleaning, sorting, grading, peeling, Size reduction, mixing and forming, Separation techniques, Process Plant design

Unit III: Food Packaging **8**
- Introduction, Types, printing, interaction between packaging and foods, environmental consideration.

Suggested Readings:

- Fellows P J (2002), *Food Processing Technology- Principles and Practices*, 2nd Edition. Woodhead Publishing Ltd
- Earle RL. 1985. *Unit Operations in Food Processing*. Pergamon Press.
- Fellows P. 1988. *Food Processing Technology*. VCH Ellis Horwood.
- Heldman DR & Singh RP.1995. *Food Process Engineering*. AVI Publ.
- McCabe WL & and Smith JC. 1971. *Fundamental of Food Engineering*. AVI Publ.
- Sahay KM & Singh KK. 1994. *Unit Operation of Agricultural Processing* Vikas Publ. House.
- Singh RP & Heldman DR. 1993. *Introduction to Food Engineering*. Academic Press.

Teaching Plan:
Week 1- 5: Properties of Foods and Processing
Week 6-10: Unit Operations on Food Processing
Week 11-12: Food Packaging

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the basic concepts of properties of foods and basic food engineering concepts	Lectures, discussions	• Practical and test
II	Acquire the knowledge of various unit operations in food processing.	Lectures, discussions based on industrial processing, Industrial Visits	• Presentation/quiz • Visit report
III	Gain the knowledge of food packaging and its interaction with food products	Lectures, discussions,	• Presentation • Practicals on packaging material testing

FNEC 31 C: PRINCIPLES OF FOOD PROCESSING PRACTICAL

Course Objective:

To impart the understanding of properties of foods, unit operations in food processing and plant design.

Course Learning Outcome:

Student will be able to

1. Understand the basic concepts of properties of foods and basic food engineering concepts
2. Acquire the knowledge of various unit operations in food processing.
3. Gain the knowledge of food plant design.

CONTENTS **PERIODS**

Unit I **6**

1. Viscosity measurement by viscometer
2. Density measurement of food
3. Dough rheology, amylase activity
4. Food plant design
5. Determination of thermal properties of foods such as thermal conductivity, thermal diffusivity, calorific value and specific heat

Unit II **4**

1. Methods of grading and cleaning of raw materials (grains, spices, fruits and vegetables).
2. Calculation of freezing time for some typical foods

Unit III **2**

1. Market survey of packaging equipment/ processing by heat/ processing by low temperature
2. Visit to bread and biscuit industry to observe mixing and forming operation and their equipment

Suggested Readings:

- Brennan JG, Butter JR, Corell ND & Lilly AVE. 1990. *Food Engineering Operations*. Elsevier.
- Charm SE, McCabe WL, Smith JC & Harriott P.1993. *Unit Operations of Chemical Engineering*. McGraw Hills.
- Earle RL. 1985. *Unit Operations in Food Processing*. Pergamon Press.
- Fellows P. 1988. *Food Processing Technology*. VCH Ellis Horwood.
- Heldman DR & Singh RP.1995. *Food Process Engineering*. AVI Publ.
- McCabe WL & and Smith JC. 1971. *Fundamental of Food Engineering*.AVI Publ.
- Sahay KM & Singh KK. 1994. *Unit Operation of Agricultural Processing*.Vikas Publ. House.
- Singh RP & Heldman DR. 1993. *Introduction to Food Engineering*. Academic Press.

FNEC 32 C: FOOD PROCESSING TECHNOLOGY-I

Marks: 100 **Duration: 3 Hrs.**

Course Objectives: To gain in depth knowledge of technological aspects involved in processing of cereals, bakery products, meat, fish, poultry and eggs.

Course Learning Outcomes:

1. The course intends to provide knowledge of cereals and animal food processing.
2. Students will learn the processes and ingredients involved in breads, cakes and biscuit processing industry.
3. The course will train students to analyse all quality aspects of cereals and animal foods.
4. Students will gain knowledge of methods of preservation of meat, fish and poultry along with value added products from meat industry.

CONTENTS **PERIODS**

Unit I: Technology of Cereals, Legumes and oils **15**

- **Introduction to Wheat:** Structure, types/varieties, harvesting, physical & chemical properties, composition and commercial value.
- **Introduction to other cereals and millets:** Rice, maize, oats, rye, corn, pearl millet; their nutritional importance and commercial value (Puffed rice, Rice flakes, parboiling of rice, extruded and fortified rice).
- **Milling of wheat:** Roller milling process, flour grade, flour treatments (bleaching, maturing), flour for various purposes, Products and By-products.

Unit II: Introduction to Baking technology: Types of bakery products, nutritional quality and safety of products, pertinent standards & regulations. **15**

- **Bread, cakes, biscuits /crackers:** Role of ingredients & processes, equipment used, product quality characteristics, scoring of quality parameters, faults and corrective measures.
- **Breakfast cereals, macaroni products and malt**. Production and quality of breakfast cereals and macaroni products.

Unit III: Technology of Meat, Fish, Poultry, Egg and Their Products 18

- **Meat:** Composition, variety, pre-slaughter handling, slaughtering and related practices, hygiene and sanitation practices of slaughter houses, grading, ageing, curing, smoking and tenderizing of meat, meat pigments and colour changes and methods of preservation for value addition and concerns of antibiotic residues.
- **Poultry:** Production considerations, Processing plant operations (slaughter, bleeding, scalding, defeathering, eviscerating, chilling and packaging), tenderness and storage.
- **Eggs:** Composition, quality factors, storage, bacterial infection and pasteurization, freezing, drying and egg substitutes.
- **Fish:** Composition, on-board handling & preservation, drying and dehydration, curing, smoking, marinades, fermented products, canning, Modified Atmosphere Packaging, and quality factors.

Suggested Readings:

- Akoh C C and Swanson B.G. *Carbohydrates Polyesters as Fat Substitutres*, Marcal Deker, Inc, New York.
- Fabriani, G and Lintas C. (1988) *Durum Wheat Chemistry and Technology*. American Association of Cereal Chemistry Inc.
- Kent N L.(1993) *Technology of Cereals*. 4th Edi. Pergamon Press.
- Olson, V M; Shemwell G A and Pasch, S (1998) *Egg and Poultry Meat Processing*, VCH P, New York
- Winton & Winton, (1991) *Techniques of Food Analysis*. Allied Scientific Publishers.
- Balachandran K K. (1941) *Post Harvest Technology of Fish and Fish Products*. Daya Publishing House, New Delhi.
- Stadelman WJ. (1998). *Egg and Poultry Meat Processing*. VCH, New York.
- Bechtel, PJ. (1986). *Muscle as Food*. Academic Press, Orlando, FL.
- Matz A Samuel, *Bakery Technology and Engineering*.
- Pomeranz Yeshuraj, *Food Analysis: Theory and Practice*.

Teaching Plan

Week 1: technology of cereals, legumes and oilseeds- introduction to wheat: structure, types/varieties, harvesting, physical & chemical properties, composition and commercial value.

Week 2: Introduction to other cereals and millets: rice, maize, oats, rye, corn, pearl millet; their nutritional importance and commercial value.

Week 3: Milling of wheat: roller milling process, flour grade, flour treatments (bleaching, maturing), flour for various purposes, products and by-products.

Week 4: Legumes and oilseeds: composition, anti-nutritional factors, processing and storage; processing for production of edible oil, meal, flour.

Week 5: Introduction to baking technology: types of bakery products, nutritional quality and safety of products, pertinent standards & regulations.

Week 6: Bread: Role of ingredients & processes, equipment used, product quality characteristics, scoring of quality parameters, faults and corrective measures.

Week 7: Cakes: role of ingredients & processes, equipment used, product quality characteristics, scoring of quality parameters, faults and corrective measures.

Week 8: Biscuits /crackers: role of ingredients & processes, equipment used, product quality characteristics, scoring of quality parameters, faults and corrective measures.

Week 9: Breakfast cereals, macaroni products and malt (6 lectures). Production and quality of breakfast cereals and macaroni products.

Week 10: Technology of meat, fish, poultry, egg and their products- meat: composition,

variety, pre-slaughter handling,
Week 11: Slaughtering and related practices, hygiene and sanitation practices of slaughter houses, grading, ageing, curing smoking and tenderizing of meat, meat pigments and colour changes and methods of preservation for value addition and concerns of antibiotic residues.
Week 12: Poultry: production considerations, processing plant operations
Week 13: Poultry- slaughter, bleeding, scalding, defeathering, eviscerating, chilling and packaging), tenderness and storage.
Week 14: Eggs: composition, quality factors, storage, bacterial infection and pasteurization, freezing, drying and egg substitutes.
Week 15: Fish: composition, on-board handling & preservation, drying and dehydration, curing, smoking, marinades.
Week 16: Fermented products, canning, modified atmosphere packaging, and quality factors.

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Imparting knowledge of processing, quality and technology of cereals, legumes and oilseeds	Lectures, discussions and visit to cereals processing industry	• Assessment of quality of cereals-practical based • Visit report
II	Learning baking technology of breads, cakes and biscuits with focus on industrial production of these products.	Lectures, discussions based on industrial uses/ industrial processing	• Presentation/quiz • Practicals on quality aspects of baked products
III	Learning technological aspects of processing of meat, fish, poultry and eggs.	Lectures, discussions,	• Presentation • Practicals on quality

FNEC 32 C: FOOD PROCESSING TECHNOLOGY-I PRACTICAL

Marks: 50 **Duration: 3 Hrs.**

Course Objectives: To gain in depth knowledge of processing aspects involved in processing of cereals, bakery products, meat, fish, poultry and eggs.

Course Learning Outcomes:
Student will be able to
1. Perform the quality testing of flour.
2. Learn the processes and ingredients involved in breads, cakes and biscuit processing industry.
3. Study the Study of Quality of meat, fish, poultry and eggs.

CONTENTS **PERIODS**

Unit I Technology of Cereals and Cereal Products **6**

- Quality testing of wheat flour: Gluten quality and quantity, moisture, ash, water Absorption Power (WAP), Pekar color test, maltose value, falling number, Dough Raising Capacity (DRC).

Unit II Introduction to Baking Technology **5**

- Bread Processing: Straight dough method, sponge & dough method (delayed salt method) and use of improvers in bread, optimisation of brown bread process, preparation of sweet buns/pizza base/ Nan/French pao.
- Biscuits: Short and hard dough biscuits, their quality parameters packaging and shelf life study.
- Cakes: Sponge and cream cakes/ eggless cakes, their quality parameters, packaging and shelf life study.
- Others such as cookie, nan-khatai

Unit III Technology of Meat, Fish, Poultry, Egg and Their Products **1**

- Study of Quality of meat, fish, poultry and eggs.

Suggested Readings:

- Kent, N.L. 2003. *Technology of Cereal*, 5th Ed. Pergamon Press.
- Chakraverty. 1988. *Post -harvest Technology of Cereals, Pulses and Oilseeds*, revised Ed., Oxford & IBH Publishing Co. Pvt Ltd.
- Marshall, *Rice Science and Technology*. 1994. Wadsworth Ed., Marcel Dekker, New York.
- Manay, S. and Sharaswamy, M. 1987. *Food Facts and Priniciples*.Wiley Eastern Limited.
- Dubey, S.C. (2007). *Basic Baking* 5th Ed. Chanakya Mudrak Pvt. Ltd.
- Raina et.al. (2003). *Basic Food Preparation-A complete Manual*. 3rd Ed. Orient Longman Pvt. Ltd.
- BIS standards of wheat, biscuits and cakes.
- Manuals of methods of analysis of various food products, FSSAI, 2016

FNOE31: COMMUNITY NUTRITION ASSESSMENT
THEORY

Marks: 100 **Duration: 3 hrs**

Course Objectives:

The purpose of this course is to enable the students to understand the concept and methods of nutritional status assessment of a community. This will help them to comprehend the nutrition concerns among communities, the correct screening criteria for malnutrition, along with strategies to combat and prevent them.

Course Learning Outcomes:

On completion of the course, students are expected to be able to –

1. Understand the concept and purpose of nutritional status assessment in community setting.
2. Explain nutritional concerns among vulnerable sections of the community and strategies to combat them.
3. Gain knowledge with regard to standard methods and techniques for assessing nutritional status.
4. Be familiar with the use of indices and indicators for screening and consequent identification of malnutrition in the community

CONTENTS **PERIODS**

Unit I: Introduction to Nutritional Status Assessment **6**

- Definition of nutritional status
- Purpose of nutritional status assessment in community setting
- Significance of standardized methods and techniques for assessing nutritional status
- Major nutritional concerns among vulnerable sections of the community and National strategies to combat malnutrition.

Unit II: Methods of Community Nutritional Assessment **14**

- Clinical examination, Anthropometry, Biochemical and Biophysical methods
- Measurement tool techniques and errors
- Standardization of methods
- Data recording, analysis and interpretation
- Use, plotting and interpretation of growth chart
- Rapid assessment procedures for community nutrition assessment and nutrition programme planning and evaluation
- Dietary methods: 24 hour recall, Food Frequency Questionnaire
- Ecological variables
- Vital health statistics: IMR, MMR, Under 5 Mortality rates
- National/ regional nutrition and health surveys

Unit III: Screening for Identification of Malnutrition in the Community **4**

- Indices, indicators and their interpretation

Suggested Readings:

- Jelliffe DB. *The Assessment of the Nutritional Status of the Community*. WHO Monograph.World Health Organization, Geneva 1966; 53.
- Jelliffe DB & Jelliffe EFP (1989). *Community nutritional assessment with special reference to less technically developed countries*. Oxford Medical Publications. Oxford University Press, Oxford, UK
- Gibson R S. (2005). *Principles of Nutritional Assessment*. 2nd ed. Oxford University Press.
- WHO (2006).*WHO Child growth standards: Length/height for age, weight for age, weight for length, weight for height and body mass index (2006).* Available at http:// www.who.int.
- WHO (2009). *WHO Child growth standards: Growth velocity based on weight, length and head circumference* Available at http://www. who.int
- WHO (2007). *WHO Reference Data for Children and Adolescents (5-19 years). WHO reference*. Available at http://www.who.int/growthref/en/
- Park, K. (2017) *Park's Textbook of Preventive and Social Medicine,* 24th ed. Jabalpur M/s. Banarsidas Bhanot.
- Dietary Guidelines for Indians (2011). *Dietary Guidelines for Indians: A manual* .second Edition , NIN.
- Gibney M.J., Margetts, B.M., Kearney, J. M. Arab, I., (Eds) (2004) *Public Health Nutrition,* NS Blackwell Publishing.
- IFCT (2017). *Indian food composition table,* NIN.
- Ross A C. (2012) *Nutrition in health and disease,* Lippincott Williams & Wilkins.
- Shils ME. (1988) *Nutrition in health and disease,* (Eds), Lippincott Williams & Wilkins.

Teaching Plan:
Week 1-3: Introduction to nutritional status assessment
Week 4-10: Methods of community nutritional assessment
Week 11-12: Methods of community nutritional assessment

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
	Understand the concept and purpose of nutritional status assessment in community setting.	Classroom lectures, Presentations	Test

SEMESTER IV

FNCC 415: DISSERTATION II / EXPERIENTIAL LEARNING PROJECT

(External Board, Viva and Internal Evaluation)

Marks : 150

Course Objectives
The aim of dissertation is to develop skills in conducting a research study/ working in a project and learn the process of writing a dissertation/ project report

Course Learning Outcomes:
Student will be able to
1. Know the practical aspects of, collecting data/ project work
2. Evaluate, select and use appropriate strategies for reduction, analysis and presentation of data collected during research process/ project work
3. Suitably illustrate data/ insights using various graphical and other methods.
4. Prepare a dissertation document/ project report based on research process/ project work done.

Students will be given an option of doing either
A) Dissertation or B) Project work in a chosen area congruent to their discipline/ field of study.
The research will be an original work with plagiarism check and ethical clearance.

FNEC 41 A: ADVANCED CLINICAL NUTRITION
THEORY

Marks: 100 **Duration: 3 hours**

Course Objectives:
To understand the etiology, physiological and metabolic anomalies and provide appropriate nutrition care for prevention and treatment of various disorders / diseases

Course Learning Outcome:
Students will be able to-
1. Develop a detailed understanding of the etiology, physiological and metabolic anomalies of various acute and chronic disorders / diseases
2. Demonstrate competency in nutrition assessment and diet history interview skills
3. Develop understanding and expertise on the effect of various disorders on nutritional status, nutritional and dietary requirements
4. Use critical thinking and clinical reasoning to develop nutritional care plan for prevention and treatment of various disorders / diseases
5. Apply the nutrition care process to the medical nutritional therapy of nutritionally vulnerable individuals using best evidence.

CONTENTS **PERIODS**

UNIT I: Nutrition Care **4**

- Nutrition Support – Parenteral Nutrition : International and National Guidelines

UNIT II: Hepatobiliary and Pancreatic Disorders 10

- Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications and recent advances in prevention, treatment, MNT and dietary Counselling in Nonalcoholic fatty liver disease (NAFLD), Cirrhosis, End stage liver disease (ESLD), Encephalopathy, Liver resection and transplant; Cholecystitis, Cholelithiasis, cholecystectomy, Pancreatitis.

Unit III: Diseases of Heart and Blood Vessels 10

- Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications and recent advances in prevention, treatment, MNT and dietary counselling in Myocardial Infarction, Coronary artery bypass graft (CABG), angioplasty, cerebrovascular and peripheral vascular disease, heart transplant

UNIT IV: Surgery and Critical Care 8

- Metabolic & clinical aberrations, diagnosis, complications, treatment, MNT and dietary Counselling in Metabolic Stress -Surgery, Burns, Sepsis and Trauma, Critical care

Unit V: Renal Disorders 12

- Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications and recent advances in prevention, treatment, MNT and dietary Counselling in Nephrotic Syndrome, Glomerulonephritis, Acute Renal Failure, Chronic Kidney Disease, End Stage Renal Disease (ESRD), Dialysis, Transplant, Renal Stones.

Unit VI: Neurological disorders 4

- Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications and recent advances in prevention, treatment, MNT and dietary Counselling in Alzheimer's disease, Parkinson disease, Epilepsy

Suggested Readings:

- Mahan, L. K. and Escott Stump. S. (2016) *Krause's Food & Nutrition Therapy 14th ed.* Saunders-Elsevier
- Joshi Y K.(2008) *Basics of Clinical Nutrition 2nd ed.* Jaypee Brothers Medical Publishers
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease. 10thed*. Lipincott, William and Wilkins.
- Gibney MJ, Elia M, Ljungqvist &Dowsett J. (2005) *Clinical Nutrition*. The Nutrition Society Textbook Series. Blackwell Publishing Company
- Garrow, J.S., James, W.P.T. and Ralph, A. (2000) *Human Nutrition and Dietetics. 10th ed.* Churchill Livingstone.
- Marian M, Russel M, Shikora SA. (2008) *Clinical Nutrition for Surgical Patients*. Jones and Bartlett Publishers.
- McClave, S.A., Taylor, B.E., Martindale, R.G., Warren, M.M., Johnson, D.R., Braunschweig, C., McCarthy, M.S., Davanos, E., Rice, T.W., Cresci, G.A. and Gervasio, J.M. (2016). Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). *Journal of Parenteral and Enteral Nutrition*, 40(2), pp.159-211.

Teaching Plan:

Week 1: Nutritional support- Parental nutrition

Week 2: Metabolic & clinical aberrations, diagnosis, complications, treatment, MNT and dietary Counselling in metabolic stress -surgery, burns, sepsis and trauma

Week 3: Medical nutrition therapy in Critical Care

Week 4: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Nonalcoholic fatty liver disease (NAFLD), Cirrhosis

Week 5: Etiopathophysiology, metabolic & clinical aberrations, diagnosis Complications and recent advances in prevention, treatment, MNT and dietary Counselling in End stage liver disease (ESLD), Encephalopathy, Liver resection and transplant

Week 6: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Cholecystitis, Cholelithiasis, cholecystectomy, Pancreatitis, Myocardial Infarction

Week 7: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Coronary artery bypass graft (CABG), Angioplasty

Week 8: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Cerebrovascular and peripheral vascular disease, heart transplant

Week 9: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Nephrotic Syndrome, Glomerulonephritis

Week 10: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Acute, Renal Failure, Chronic Kidney Disease

Week 11: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, Complications and recent advances in prevention, treatment, MNT and dietary Counselling in Dialysis, Transplant, Renal Stones

Week 12: Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications and recent advances in prevention, treatment, MNT and dietary Counselling in Alzheimer's disease, Parkinson disease, Epilepsy

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Develop a detailed understanding of the etiology, physiological and metabolic anomalies of various acute and chronic disorders / diseases	Discussion	Assignment on etiology, physiological and metabolic anomalies of various acute and chronic disorders / diseases
II	Demonstrate competency in nutrition assessment and diet history interview skills	Discussion	Assignment and practice interactive sessions in nutrition assessment and diet history interview skills
III	Develop understanding and expertise on the effect of various disorders on nutritional status, nutritional and dietary requirements	Discussion	Assignment on various disorders on nutritional status, nutritional and dietary requirements

IV	Use critical thinking and clinical reasoning to develop nutritional care plan for prevention and treatment of various disorders / diseases	Discussion	Diet plans for prevention and treatment of various disorders / diseases
V	Apply the nutrition care process to the medical nutritional therapy of nutritionally vulnerable individuals using best evidence.	Discussion	Planning medical nutritional therapy of nutritionally vulnerable individuals using best evidence.

FNEC 41 A: ADVANCED CLINICAL NUTRITION PRACTICAL

Marks: 50 **Duration: 3 hours**

Course Objectives:
To enable students to develop skill in nutritional diagnosis, planning and providing suitable preventive/ therapeutic diets for various diseases / disorders

Course Learning Outcome:
Student will be able to-
1. Develop skill in nutritional diagnosis, planning and providing suitable preventive/ therapeutic diets for various diseases / disorders
2. Provide effective dietary Counselling for these disorders
3. Awareness of various commercial nutritional therapeutic products available in the market

CONTENTS **PERIODS**

UNIT I: Market Survey for commercial nutritional therapeutic products **2**

UNIT II: Planning & preparation of diets for the following conditions: **10**
- Post burn
- Liver Cirrhosis
- Hepatic Encephalopathy
- Pancreatitis
- Myocardial infarction
- Congestive heart failure
- Nephritis
- Acute Renal Failure
- Chronic renal failure
- Patients on dialysis

Suggested Readings:

- Dorland WA Newman. (2003) *Dorland's Illustrated Medical Dictionary. 30th ed*. WB Saunders Co.
- Escott-Stump, S. (2002) *Nutrition and Diagnosis Related Care. 5th ed*. Williams and Wilkins.

- Garrow, J.S., James, W.P.T. and Ralph, A. (2000) *Human Nutrition and Dietetics. 10th ed.* Churchill Livingstone.
- Mahan, L. K. and Escott Stump. S. (2016) *Krause's Food & Nutrition Therapy 14th ed.* Saunders-Elsevier
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease. 10thed.* Lipincott, William and Wilkins.
- Williams, S.R. (2001) *Basic Nutrition and Diet Therapy. 11th ed.* Times Mirror Mosby College Publishing
- Davis, J. and Sherer, K. (1994) *Applied Nutrition and Diet Therapy for Nurses. (2nded).* W. B. Saunders Co.
- Fauci, S.A et al (1998) *Harrison's Principles of Internal Medicine, 14th ed*. McGraw Hill.
- Guyton, A.C and Hall, J.E. (2000) *Textbook of Medical Physiology. 10th ed.* India: Harcourt Asia.
- Ritchie, A.C (1990) *Boyd's Textbook of Pathology. 9thed.* Lea and Febiger, Philadelphia
- World Cancer Research Fund & American Institute for cancer research (2007) *Food, Nutrition, Physical Activity and the Prevention of Cancer- A Global Perspective*. Washington E.D. WCRF.
- Gibson SR. (2005). Principles of Nutritional Assessment. 2nd Edition. Oxford University press
- Gibney MJ, Margetts BM, Kearny JM & ArabI. (2004) - *Public Health Nutrition*. NS Blackwell publishing
- Gibney MJ, Elia M, Ljungqvist &Dowsett J. (2005) *Clinical Nutrition*. The Nutrition Society Textbook Series. Blackwell publishing Company
- Marian M, Russel MK, Shikora SA. (2008) *Clinical Nutrition for Surgical Patients*. Jones & Bartlett Publisher

FNEC 42 A: NUTRITION COMMUNICATION AND DIET COUNSELLING THEORY

Marks: 100 **Duration: 3 Hrs.**

Course Objectives:
To equip students to understand the influence of counselling on disease management and identify components of counselling skills and to provide skills of counselling for specific disease conditions

Course Learning Outcomes:
The students will be able to:
1. Gain knowledge on the basics of communication strategies and best suited methods of communicating with individuals to select appropriate strategies presented with dietary problems
2. Understand the importance of BCC in managing nutrition related problems
3. Draw out a complete Counselling plan for individuals based on their physiological conditions using the appropriate tools
4. Understand how best to maintain adherence to changed dietary practices for specific physiological conditions
5. Gain knowledge on traditional and alternate methods to manage disorders

CONTENTS **PERIODS**

UNIT I: Basics of Communication **12**

- Meaning of Communication, Forms of communication: Verbal and Non-verbal Communication
- Communication methods
- Traditional, Current and Emerging methods/tools of communication
- Characteristics of effective communication, Skills and attributes of a communicator
- Approaches in communication
- Barriers to effective communication

UNIT II: Nutrition Counselling **10**

- Concept and importance of Counselling in the nutrition care process
- Understanding dietary patterns and food choices and their impact on Counselling
- Behaviour Change Communication and Models for behaviour change
- Counselling strategies
- Factors to be considered for Counselling
- Conventional and non-conventional tools in Counselling

UNIT III: Processes involved in Dietary Counselling **6**

- Managing resources of the communicator/counsellor
- Designing of Counselling plans – goals & objectives, evaluation instruments.
- Implementation: facilitating self-management of disease condition
- Evaluation: evaluating adherence to dietary changes
- Counselling approaches after evaluation

UNIT IV: Dietary Counselling through the Life Span **16**

Considerations for Counselling plans for:

- Antenatal and pregnant women
- Lactating women
- Childhood nutrition problems like
- SAM, weight management, vitamin and mineral deficiencies
- School children, adolescents, young adults
- Fitness, weight management, eating disorders

Managing diet related chronic diseases in adults:

- Obesity
- Diabetes
- Dyslipidemia
- Hypertension
- Cancer risk prevention
- Renal disease
- Liver disorders
- Geriatric counselling

UNIT V: Nutritional/medicinal Role of Traditional Foods **4**

- Traditional food beliefs

- Role of Ayurveda, Naturopathy,Yoga and other traditional medicines in disease management

Suggested Readings:

- Mahan, L. K. and Escott Stump. S. (2016) *Krause's Food & Nutrition Therapy* 14th ed. Saunders-Elsevier
- Snetselaar L. (2009). *Nutrition Counselling Skills for the Nutrition Care Process*. Fourth Ed. Sudbury, Massachusetts: Jones Bartlett Publishers.
- Holli B Betsy and Beto A Judith. (2014). *Nutrition Counselling and Education Skills for Dietetics Professionals*. Sixth edition. USA: Lippincot Williams and Wilkins; Wolters Kluwer.
- Gable J. (2016). *Counselling Skills for dietitians*. Florida, USA: JohnWiley and Sons.
- Midwinter R and Dickson J.(2015). *Embedding Counselling and Communication Skills. A Relational Skills Model*. Routledge 2015
- Devito Joseph A. (2015) *Human Communication: The Basic Course*. New York:Pearson
- King K and Klawitter B.(2007). *Nutrition Therapy. Advanced Counselling Skills*. Third Edition. Philadelphia, USA: Lippincot Williams and Wilkins; Wolters Kluwer. 2007
- http://www.fao.org/docrep/X2550E/X2550e04.htm
- Ravi M (2016*) Counselling what why and how*, New Delhi, Viva Books
- McClave, S.A., Taylor, B.E., Martindale, R.G., Warren, M.M., Johnson, D.R., Braunschweig, C., McCarthy, M.S., Davanos, E., Rice, T.W., Cresci, G.A. and Gervasio, J.M. (2016). Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). *Journal of Parenteral and Enteral Nutrition*, 40(2), pp.159-211.
- WHO 2016, Antenatal guidelines

Teaching Plan:

Week 1: Meaning of Communication, Forms of communication: Verbal and Non-verbal Communication, Communication methods: Intrapersonal, Interpersonal and Mass communication

Week 2: Traditional, Current and Emerging methods/tools of communication, Characteristics of effective communication, Skills and attributes of a communicator

Week 3: Approaches in communication: Informative, Educative, persuasive and prompting, Barriers to effective communication: physical, intellectual, emotional, environmental, and cultural

Week 4: Meaning and concept and importance of counselling in the nutrition care process, Understanding dietary patterns and food choices and their impact on counselling

Week 5: Counselling for behaviour change: Models for behaviour change- Health belief model, Social Cognitive Theory, Theory of Planned behaviour, Trans theoretical Model of Change

Week 6: Factors to be considered for counselling, managing resources of the facilitator/counsellor, designing of counselling plans – goals & objectives, planning client care and designing evaluation instruments.

Week 7: Implementation, Evaluation, Counselling approaches after assessment

Week 8: Considerations for counselling for Prenatal and pregnant women, Lactating women

Week 9: Considerations for counselling for Childhood nutrition problems and School children, adolescents, young adults

Week 10: Managing diet related chronic diseases in adults: Obesity, Diabetes, dyslipidemia, hypertension
Week 11: Considerations for counselling for Managing diet related chronic diseases in adults and geriatric counselling
Week 12: Nutritional/medicinal role of traditional foods: traditional food beliefs, role of Ayurveda, Naturopathy, Yoga and other traditional medicines in and disease management

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	To gain knowledge on the basics of communication strategies and best suited methods of communicating with individuals to select appropriate strategies presented with dietary problems	Discussion	Assignment on methods of communications
II	To understand the concept of BCC in nutrition	Discussion	Group discussions on theories of BCC
III	Draw out a complete Counselling plan for individuals based on their physiological conditions using the appropriate tools	Discussion on overall plan with case studies	Practical preparation of counselling plans for a hypothetical situation
IV	Understand how best to maintain adherence to changed dietary practices for specific physiological conditions	Discussion on case studies for each condition	Student presentations and assignments.
V	To gain knowledge on traditional and alternate methods to manage disorders	Discussion	Group discussions on various alternate methods of medicine in India

NUTRITION COMMUNICATION AND DIET COUNSELLING PRACTICAL

Marks: 50 **Duration: 3 Hrs.**

Course Objectives:
To gain practical knowledge in preparing Counselling sessions for selected conditions and to identify appropriate counselling strategies for different age groups and physiological conditions

Course learning Outcome:
The students will be able to-
1. Acquire knowledge in different methods of Counselling
2. Plan counselling sessions for different physiological conditions

CONTENT **PERIODS**

UNIT I: **Understanding the use of conventional and non-conventional methods of counselling** **2**

- Face to face counselling
- Use of a software for counselling e.g Dietcal
- Use of any one Diet App for counselling and assessing food intake

UNIT II: Planning Nutrition Counselling sessions and identifying ways to adhere to dietary changes for the following conditions **10**

- IYCF, Lactation Counselling, SAM, Antenatal counselling
- Eating Disorders
- Overweight/Obesity in School children, adolescent and adults
- Metabolic Syndrome
- Diabetes: Type 1, Type 2 and Gestational Diabetes
- Renal Disease: CKD/ESRD/Post kidney Transplant
- Liver Disorders: NAFLD

Suggested Readings:

- Mahan, L. K. and Escott Stump. S. (2016) *Krause's Food & Nutrition Therapy* 14th ed. Saunders-Elsevier
- Snetselaar L. (2009). *Nutrition Counselling Skills for the Nutrition Care Process*. Fourth Ed. Sudbury, Massachusetts: Jones Bartlett Publishers.
- Holli B Betsy and Beto A Judith. (2014). *Nutrition Counselling and Education Skills for Dietetics Professionals*. Sixth edition. USA: Lippincot Williams and Wilkins; Wolters Kluwer.
- Gable J. (2016). *Counselling Skills for dieticians*. Florida, USA: JohnWiley and Sons.
- Midwinter R and Dickson J. (2015). *Embedding Counselling and Communication Skills. A Relational Skills Model.* Routledge 2015
- Devito Joseph A. (2015) *Human Communication: The Basic Course*. New York: Pearson
- King K and Klawitter B (2007). *Nutrition Therapy*. Advanced Counselling Skills. Third Edition. Philadelphia, USA: Lippincot Williams and Wilkins; Wolters Kluwer. 2007
- http://www.fao.org/docrep/X2550E/X2550e04.htm
- McClave, S.A., Taylor, B.E., Martindale, R.G., Warren, M.M., Johnson, D.R., Braunschweig, C., McCarthy, M.S., Davanos, E., Rice, T.W., Cresci, G.A. and Gervasio, J.M. (2016). Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). *Journal of Parenteral and Enteral Nutrition*, 40(2), pp.159-211.
- WHO 2016, Antenatal guidelines

FNEC 43A: NUTRITION FOR FITNESS AND SPORTS
THEORY

Marks: 100 **Duration : 3 hrs**

Course Objectives:

To learn the concepts of fitness, methods of assessing fitness, exercises for physical fitness and bioenergetics of exercise and role of macro- and micro-nutrients in sports performance and to gain knowledge & application skills with respect to nutrition for high performance sports, through the life-cycle and diet & nutritional care of special groups of athletes.

Course Learning Outcomes:

Students will be able to:

1. Understand concepts of fitness, its assessment and exercises for physical fitness training.
2. Function effectively as a sports dietitian, with knowledge and skills, to support recreational and competitive athletes
3. Exhibit knowledge of the metabolism and bioenergetics of exercise and continuum in various sports
4. Successfully plan, implement and monitor sport-specific diets for athletes through all age groups
5. Provide diet and nutritional care in terms of nutrition education, diet plans and counselling to special groups of athletes

CONTENT **PERIODS**

UNIT I: Introduction to Physical Fitness **6**

- Definition of physical fitness
- Components of physical fitness
- Methods of assessing physical fitness
- Approaches to achieving physical fitness through the life cycle

UNIT II: Fundamentals of Sports Nutrition **14**

- Integrated approach to care for athletes
- Assessment of Sports performance
- Bioenergetics and body metabolism of physical activity and sports
- Macro- and micro nutrients for sport performance
- Temperature regulation, fluid balance, fluid requirements of athletes and rehydration strategies for sports

UNIT III: Nutrition for High Performance Athletes **20**

- Recommended allowances and nutritional guidelines for different categories of high performance sports
- Nutritional care during Training, weight management and day-today recovery
- Nutrition for the Pre-competition, Competition and post competition recovery phase
- Supplements in Sport :performance enhancing substances ,drugs, ergogenic aids and herbs in sports performance

UNIT IV: Challenges in Sports Nutrition` **8**

- Nutritional care for children and adolescent athletes
- Athletes with special needs- Paralympics & special Olympics, vegetarian athletes,
- Athletes with eating disorders, athletes with diabetes and other medical conditions , management of Red-S**.**

Suggested Readings:

- ILSI, NIN &SAI. (2017) *Nutritional recommendations for high performance athletes2nd ed.*
- Mahan, L. K. and Escott Stump S. (2016) *Krause's Food & Nutrition Therapy. 14th ed.* Saunders-Elsevier.
- Hickson JF and Wolinksky I. (1997) *Nutrition for exercise and Sport. 2nd ed.*CRC Press,

- Burke LM and Deakin V. (2002) *Clinical Sports Nutrition, 2nd edition*, Publishers McGraw Hill
- Dan Benardot. (2011) *Advanced Sports Nutrition-2nd Edition.*
- Fink H H and Mikesky A E. (2017) *Practical Applications in Sports Nutrition 5th Edition.*
- Bushman B. (2017) *ACSM's Complete Guide to Fitness & Health 2nd Edition* Published by ACSM.
- Vasuja, M (2017). *Health Education and Sports Nutrition*. New Delhi, Friend's Publication (India)

Teaching Plan:

Week 1: Definition of physical fitness, Components of physical fitness, Methods of assessing physical fitness

Week 2: Approaches to achieving physical fitness through the life cycle, Assessment of Sports performance

Week 3: Bioenergetics and body metabolism of physical activity and sports

Week 4: Macro- and micro nutrients for sport performance

Week 5: Temperature regulation, fluid balance, fluid requirements of athletes and rehydration strategies for sports

Week 6: Recommended allowances and nutritional guidelines for different categories of high performance sports

Week 7: Nutritional care during Training, and day-today recovery

Week 8: Nutrition for the Pre-competition, Competition and post competition recovery phase

Week 9: Weight management in athletes

Week 10: Supplements in Sport: performance enhancing substances, drugs, ergogenic aids and herbs in sports performance

Week 11: Nutritional care for children and adolescent athletes**,** Athletes with special needs-Paralympics & Special Olympics, vegetarian athletes,

Week 12: Managing athletes with eating disorders, and Red-S**.,** Dietary care for athletes with diabetes and other medical conditions

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Develop concepts of physical fitness, its components, skills in assessment and exercises to improve physical fitness	Various fitness exercises and assessments in groups	• Assessment scores of partners' physical fitness. • Test on the topic
II	Exhibit knowledge of metabolism & nutritional care for athletes and demonstrate skills of assessing sports performance	Demonstration and discussion	• Test on knowledge domain • Assessment using skills learnt-case study
III	Develop in- depth understanding and critically	Presentations, discussions and	Class assignments, scrap books, survey reports and diet plans

	evaluate and apply nutritional recommendations for different categories athletes, during various phases and a comprehensive view on supplements in Sport	surveys	
IV	Understand comprehensively, needs of children, adolescents and special groups in sports training	Discussion	Diet plans for junior athletes and athletes with special needs

FNEC 43 A: NUTRITION FOR FITNESS AND SPORTS PRACTICAL

Marks: 50 **Duration: 3 hours**

Course Objectives:

To apply knowledge of Sports nutrition to plan diets for sport-specific training, pre-competition, competition and recovery and to gain skills for counselling of individual athlete through various phases

Course Learning Outcomes:

Students will be able to-

1. Apply knowledge of Sports nutrition to plan diets for sport-specific training, pre-competition, competition and recovery.
2. Gain skills for counselling of individual athlete through various phases
3. Learn skills for care of special groups of athletes.

CONTENTS **PERIODS**

UNIT I **1**

- PARQ assessment and interpretation for fitness

UNIT II **1**

- Planning a day's diet for a fitness trainee who works out twice in a gymnasium

UNIT III **5**

- Planning a training day's diet for an individual high performance athlete(any one sport-(cover all categories of sports in groups)
- Planning a weight loss diet for a high performance athlete
- Planning a Counselling module for the training phase for a high performance athlete any one sport (cover all categories of sports in groups)
- Planning a diet for 1 week of carbohydrate loading for an ultra-endurance athlete
- Planning a pre-, and post-competition meal for ultra-endurance, endurance, strength events, team events and sports-drinks during and after an event

UNIT IV **5**

- Planning a diet for multiple events like swimming competitions
- Survey of sports supplements

- Planning an education module for special groups of athletes : Diabetes, special
- Cooking

Suggested Readings:

- ILSI, NIN &SAI. (2017) *Nutritional recommendations for high performance athletes* 2nded.
- Mahan, L. K. and Escott Stump S. (2016) *Krause's Food & Nutrition Therapy* 14th ed. Saunders-Elsevier.
- Hickson JF and Wolinksky I. (1997) *Nutrition for exercise and Sport 2nd ed.* CRC Press.
- Burke LM and Deakin V. (2002) *Clinical Sports Nutrition, 2nd edition*, Publishers McGraw Hill.
- Dan Benardot. (2011) *Advanced Sports Nutrition-2nd Edition.*
- Fink H H and Mikesky A E. (2017) *Practical Applications in Sports Nutrition 5th Edition.*
- Bushman B. (2017) *ACSM's Complete Guide to Fitness & Health 2nd Edition* , Published by ACSM.

FNEC41B: PROBLEMS, POLICIES AND PROGRAMMES IN PUBLIC HEALTH NUTRITION
THEORY

Marks: 100 **Duration: 3 Hrs**

Course Objectives:

This course will enable the students to become familiar with the prevalence and determinants of nutritional/ health problems in the population. They will learn about the public health implications of various nutritional problems and the strategies to overcome the same. The students will also get acquainted with the various national/ public sector policies and programmes for promotion of health and nutritional status in India.

Course Learning Outcomes:

The students will:

1. Become familiar with the prevalence and determinants of nutritional/ health problems in the population.
2. Acquire knowledge about the public health implications of various nutritional problems and the strategies to overcome the same.
3. Get acquainted with national/ public sector policies and programmes for promotion of health and nutritional status in India.

CONTENTS **PERIODS**

UNIT I: Public Health Aspects of Undernutrition **18**

- Etiology, public health implications, preventive strategies and community based management of Protein Energy Malnutrition, Chronic Energy Deficiency, Severe Acute Malnutrition and major micronutrient deficiencies (Vitamin A Deficiency, Nutritional Anemias, Iodine Deficiency Disorders, Vitamin D Deficiency and Osteoporosis, Zinc Deficiency) and emerging nutrient deficiencies of public health significance
- Maternal Nutrition, Adolescent Nutrition and Anemia

Unit II: Public Health Aspects of Life Style Related Disorders 8

- Public health implications and preventive strategies for obesity, hypertension, coronary heart disease, diabetes, osteoporosis, cancer and dental caries

Unit III: National / Public Sector Policies for Promotion of Nutrition and Health Status of the Population 8

- National Nutrition Policy, *Poshan* Abhiyan, National Health Policy, National Food Security Act, National Water Policy, National Urban Sanitation Policy

Unit IV: National / Public Sector Programmes for Promotion of Nutrition and Health Status of the Population 14

- Nutrition sensitive and nutrition specific programmes
- Critical appraisal of ongoing public sector programmes and some success stories

Teaching Plan:

Week 1-4: Public Health Aspects of Undernutrition

Etiology, public health implications, prevention and community based management of Protein Energy Malnutrition, Chronic Energy Deficiency, Severe Acute Malnutrition and micronutrient deficiencies of public health significance

Week 5 -6: Public Health Aspects of Life Style Related Disorders

Week 6-7: National / Public Sector Policies for Promotion of Nutrition and Health Status of the Population

Week 8-12: National / Public Sector Programmes for Promotion of Nutrition and Health Status of the Population

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Public Health Aspects of Under-nutrition	Presentations, Discussion	Assignment on current nutrition concerns
II	Public Health Aspects of Life Style Related Disorders	Presentations, Discussion	Test on the topics
III	National / Public Sector Policies for Promotion of Nutrition and Health Status of the Population	Presentations, Discussion	Article review, current status of programmes and evaluation
IV	National / Public Sector Programmes for Promotion of Nutrition and Health Status of the Population	Presentations, Discussion	Critique of nutrition sensitive and specific programmes

FNEC41B: PROBLEMS, POLICIES AND PROGRAMMES IN PUBLIC HEALTH NUTRITION PRACTICAL

Marks : 50 **Duration : 3 Hrs**

Course Learning Outcomes:

The students will:

1. Acquire skills to do critical appraisal of public health nutrition programmes.
2. Become familiar with methods of preparation and implementation of plans/ tools for evaluation of public health nutrition programmes.

CONTENTS **PERIODS**

Unit I: Critical appraisal of ongoing national public health nutrition programmes. **4**

Unit II: Preparation of evaluation, monitoring and surveillance plans for public health nutrition programmes/ and their components – preparation of evaluation tools and their implementation. **8**

Suggested Readings:

- Gibney M.J., Margetts, B.M., Kearney, J. M. Arab, I., (Eds) (2004) *Public Health Nutrition*, NS Blackwell Publishing.
- National Consensus Workshop on Management of SAM children through Medical Nutrition Therapy (2009)-Compendium of Scientific Publications Volume I and II. Jointly organized by AIIMS, Sitaram Bhartia Institute of Science and Research, IAP (Subspeciality chapter on Nutrition), New Delhi. Sponsored by DBT.
- National Nutrition Policy, GoI. http://wcd.nic.in/sites/default/files/nnp_0.pdf
- Park, K. (2017) *Park's Textbook of Preventive and Social Medicine*, 24th edition. Banarsidas Bhanot Publishers.
- Vir, S.C. (Ed.). (2011). *Public Health Nutrition in Developing Countries*. Part 1 and 2. Woodhead Publishing India.

FNEC 44 B: NUTRITIONAL EPIDEMIOLOGY

Marks : 100 **Duration : 3 hrs**

Course Objectives:

The purpose of this course is to enable the students to understand the principles of disease causation with emphasis on modifiable environmental factors including dietary factors. This will also help students appreciate the effect of quality measures of nutritional exposure and nutrition related health outcomes on determination of diet-disease relationship. This will encourage the application of epidemiology to prevention of disease and promotion of health through nutrition.

Course Learning Outcomes:

On completion of the course, students are expected to be able to –

1. Describe major study designs in nutritional epidemiology and select an appropriate design for addressing a study question.
2. Explain implication of study design and methods of diet and nutritional status assessment in interpreting studies in nutritional epidemiology
3. Explain the role of epidemiological research in improving health and nutritional status
4. Demonstrate knowledge of epidemiological approach to defining and measuring occurrence of nutrition and health related states in population
5. Demonstrate the knowledge of epidemiological approach to causation

CONTENTS **PERIODS**

UNIT I: Basic Epidemiology Concepts and Methods **17**

- Definition, scope and purpose of epidemiology
- Basic measurements in epidemiology
- Measurement of mortality, morbidity and disability – rates, ratios and proportions
- Comparison of disease occurrence- absolute and relative comparisons
- Epidemiologic study methods- observational and experimental studies
- Observational epidemiology- descriptive and analytical studies – ecological, cross sectional, care-control and cohort
- Experimental epidemiology- experimental and quasi experimental trials
- Randomized control trials, Field trials and community trials
- Population, sampling, sample size and power
- Introduction to nutritional epidemiology: Definition, scope and significance of nutritional epidemiology in public health nutrition.
- Design, steps in conducting the studies, data analysis and interpretation
- Association and causation in epidemiology
- Potential errors in epidemiologic studies
    - Measurement error and bias
    - Internal and external validity

UNIT II: Epidemiologic Approaches to Diet-Disease Relationships **12**

- Measuring diet –disease associations- Type of measurement , time trends, correlation and regression, risk assessment
- Design of nutritional epidemiological studies
- Strengths and weaknesses of various designs in estimation of diet disease relationships, interpretation of epidemiologic research, multi variate relationship of diet and disease
- Genetics in nutritional epidemiology- genetic variation and epigenetics in nutritional epidemiology- Gene diet interactions.
- Ethical aspects of research in nutritional epidemiology

UNIT III: Measurements of Exposure and Outcomes in Nutritional Epidemiology **14**

- Nutritional exposures- Relevant direct and indirect measures of nutrition and health assessment
- Critical review of diet assessment methods- assessment of food consumption at different levels, measurement errors, strengths and limitations, reproducibility and validity of methods measuring food consumption of individuals- 24 dietary recall, diet record and food frequency methods/Analysis of dietary patterns. Analysis and interpretation of dietary data.
- Nutritional status assessment: Critical review of anthropometeric and various direct measures pf nutritional status- clinical , biochemical, biophysical and measures of body composition. Sources of errors, strengths and limitations of various measures. Relevance and use of various indices and indicators of nutritional status for risk assessment.
- Biomarkers in nutritional epidemiology: Uses and limitations of biomarkers as measures of nutritional status and in dietary validation studies.
- Physical activity assessment and interpretation: Strength and weaknesses of subjective and objective methods.
- Ecological assessment of nutritional status, socio-economic, demographic, cultural and political factors.

UNIT IV: Role of Epidemiological Research in Development of Nutrition Related Policies and their Evaluation **5**

- Generating evidence for policy making, strengthening implementation of nutrition and health interventions and programmes, evaluation of the effectiveness of such interventions. Examples of use of epidemiological research data for improvement of nutrition and health interventions or national programmes.

Suggested Readings:

- Bonita, R., Beaglehole, R., Kjellström T. (2006) *Basic Epidemiology*, 2nd Edition, WHO, 2006 http://whqlibdoc.who.int/publications/2006/9241547073_eng.pdf
- Moon, G., Gould, M. (2000). *Epidemiology: An Introduction*. Philadelphia, Open University Press
- Langseth L. (1996). *Nutritional Epidemiology: Possibilities and Limitations*. Washington DC, ILSI Press.
- Gordis L. *Epidemiology*. 5th ed. Philadelphia, PA: Saunders Elsevier, 2013
- Aschengrau A., Seage G.R. (2014) *Essentials of Epidemiology in Public Health*. 3rd ed. Sudbury, MA: Jones & Bartlett.
- Willett, W. (2013) *Monographs in Epidemiology and Biostatistics*, Third Edition, Oxford University Press.
- Park, K. (2017) *Park's Textbook of Preventive and Social Medicine*, 24th ed. Jabalpur M/s. Banarsidas Bhanot
- Vir, S. (2011) *Public health nutrition in developing countries*, Woodhead Publishing India limited
- Gibney, M.J., Margetts, B.M., Kearney, J.M., Arab, L. (Eds) (2004) *Public Health Nutrition.* NS Blackwell Publishing
- Gibson, R. S. (2005). *Principles of Nutritional Assessment*. 2nd ed. Oxford University Press

Teaching Plan:

Week 1 Basic epidemiology concepts and methods
Week 2 Basic epidemiology concepts and methods
Week 3 Basic epidemiology concepts and methods
Week 4 Basic epidemiology concepts and methods
Week 5 Epidemiologic approaches to diet-disease relationships
Week 6 Epidemiologic approaches to diet-disease relationships
Week 7 Epidemiologic approaches to diet-disease relationships
Week 8 Measurements of exposure and outcomes in Nutritional epidemiology
Week 9 Measurements of exposure and outcomes in Nutritional epidemiology
Week 10 Measurements of exposure and outcomes in Nutritional epidemiology
Week 11 Role of Epidemiological research in development of nutrition related policies and their evaluation
Week 12 Role of Epidemiological research in development of nutrition related policies and their evaluation

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand major study designs in nutritional epidemiology and selection of an appropriate design for addressing a study question.	Presentations, Discussion	Test on the topic
II	Comprehend implication of study design and methods of diet and nutritional status assessment in interpreting studies in nutritional epidemiology	Presentations, Discussion	Review of related references
III	Explain the role of epidemiological research in improving health and nutritional status	Presentations, Discussion	Review and presentation of various examples
IV	Demonstrate knowledge of epidemiological approach to defining and measuring occurrence of nutrition and health related states in population	Presentations, Discussion	Test and Quiz
V	Demonstrate the knowledge of epidemiological approach to causation	Presentations, Discussion	Review of articles

FNEC 44 B: NUTRITIONAL EPIDEMIOLOGY PRACTICAL

Marks : 50 **Duration : 3 Hrs**

Course Objective:
The course will enable students to critically review research articles specifically with emphasis on research design, sampling, analysis and interpretation of data. It will also enhance their skills to perform secondary data analysis as well as to interpret and estimate errors in anthropometric data.

Course Learning Outcomes:

1. To acquire skills in critically reviewing original research paper and be able to perform secondary data analysis for documenting change in nutrition and health problems
2. To be able to determine reliability and validity of an assessment tools
3. To interpret and estimate errors in anthropometric data

CONTENTS **PERIODS**

Unit I: Critically review original research on studies in the field of nutritional epidemiology and do the following: **5**

- Identify research designs used, sampling, analyses and interpretation.
- Identify applications of research evidence in the field of public health nutrition

Unit II: Determine reliability and validity of an assessment tool **2**

Unit III: Estimate measurement error in anthropometric data **3**
Interpret anthropometric data available from national and regional surveys

Unit IV: Review and document the changes in nutrition and health problems in vulnerable groups of the population in the last decade using secondary data (Indicators of mortality, morbidity, disability and nutritional status). **2**

Suggested Readings:

- Bonita, R., Beaglehole, R., Kjellström T. (2006) *Basic Epidemiology*, 2nd Edition, WHO, 2006 http://whqlibdoc.who.int/publications/2006/9241547073_eng.pdf
- Moon, G., Gould, M. (2000). *Epidemiology: An Introduction*. Philadelphia, Open University Press
- Langseth L. (1996). *Nutritional Epidemiology: Possibilities and Limitations*. Washington DC, ILSI Press.
- Gordis L. *Epidemiology*. 5th ed. Philadelphia, PA: Saunders Elsevier, 2013
- Aschengrau A., Seage G.R. (2014) *Essentials of Epidemiology in Public Health*. 3rd ed. Sudbury, MA: Jones & Bartlett.
- Willett, W. (2013) *Monographs in Epidemiology and Biostatistics*, Third Edition, Oxford University Press.
- Park, K. (2017) *Park's Textbook of Preventive and Social Medicine*, 24th ed. Jabalpur M/s. Banarsidas Bhanot
- Vir, S. (2011) *Public health nutrition in developing countries*, Woodhead Publishing India limited
- Gibney, M.J., Margetts, B.M., Kearney, J.M., Arab, L. (Eds) (2004) *Public Health Nutrition.* NS Blackwell Publishing
- Gibson, R. S. (2005). *Principles of Nutritional Assessment*. 2nd ed. Oxford University Press.

FNEC 45 C: NUTRITION COMMUNICATION FOR HEALTH PROMOTION THEORY

Marks : 100 **Duration : 3 Hrs**

Course Objectives:

This course will enable students to understand the concept of Dietary guidelines and their relevance. They will understand the determinants of food behavior and will acquire skills to plan, implement and evaluate behaviour change communication for promotion of nutrition and health among vulnerable groups. The students will also learn about nutrition advocacy and ethical considerations in nutrition communication.

Course Learning Outcomes:

The students will be able to:

1. Become Familiar with the concept of Dietary guidelines and their relevance.
2. Acquire skills to plan, implement and evaluate social and behaviour change communication for promotion of nutrition and health among the vulnerable groups.
3. Develop an understanding of the concept of nutrition advocacy.
4. Learn the ethics in nutrition and health communication.

CONTENTS **PERIODS**

Unit I: Dietary guidelines for nutrition and health related concerns **10**

National and international guidelines and their role in nutrition promotion. Critical appraisal of the current guidelines.

Unit II: Nutrition and behaviour inter-relationship **8**

Food and health behaviour, models/ theories of health behaviour, food choices, strategies for intervention at the ecological and individual level

Unit III: Social and Behaviour Change Communication for Nutrition and Health Promotion **20**

- Concept and objectives of communication for behaviour change
- Planning of communication strategies for social and behaviour change programme,
- Communication needs analysis, stakeholders in nutrition promotion, developing nutrition education plan, identifying communication strategies/ approaches for nutrition and health promotion (e.g. social marketing), designing nutrition and health messages, selecting communication channels, developing and field testing of communication materials, designing training strategies for trainers and their capacity building.
- Implementing social and behaviour change communication intervention: an overview
- Evaluation of social and behaviour change communication programmes

Unit IV: Nutrition Advocacy **8**

- Meaning, types, tools and techniques and advocacy planning.
- Role of advocacy in nutrition policy formulation, preparation of policy briefs.

Unit V: Ethics in nutrition and health communication **2**

- Significance of ethics in nutrition and health communication
- Ethical Principles and concerns

Suggested Readings:

- Gibney M.J., Margetts, B.M., Kearney, J.M., Arab, L. (Eds) (2004) *Public Health Nutrition*.NS Blackwell Publishing.
- Prochaska, K.L., *The Transtheoretical Model of Behavioural Change*, Shumaker SA(Eds).
- Robert C. Hornik , (2002) *Public Health Communication: Evidence for BehaviourChange*, Lawrence Erlbaum Associates, Inc.
- Ray E.B. and Donohew L. (1990) *Communication and Health: Systems and Applications*. Lawrence Erlbaum Associates, Inc.
- Maibach E. and Parrott R.L. (1995) *Designing health messages: Approaches from Communication Theory and Public Health Practice*. Sage Publications, Inc.
- Boyle M.A. (2016*). Community Nutrition in Action: An Entrepreneurial Approach*. 7th Edition. Brooks Cole.

- Vir S.C. (Ed). (2012) *Nutrition-Health education and communication for improving women and child nutrition. Public Health and Nutrition in Developing Countries (Part II)*.Woodhead Publishing India Pvt. Ltd.
- USAID. *Effective At-Scale Nutrition Social and Behavior Change Communication*. Multi-Sectoral Nutrition Strategy 2014–2025 Technical Guidance Brief.
- McNulty J. (2013*) Challenges and issues in nutrition education*. Rome: Nutrition Education and Consumer Awareness Group, Food and Agriculture Organization of the United Nations. Available at: www.fao.org/ag/humannutrition/nutritioneducation/en/
- USAID (2010) *Behavior Change Communication* (BCC). Learning Resource Package. Facilitator's Guide.
- O'Sullivan, G.A., Yonkler, J.A., Morgan, W., and Merritt, A.P. (2003) *A Field Guide to Designing a Health Communication Strategy*, Baltimore, MD: Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs, March 2003.

Teaching Plan:

Week 1: National and international guidelines and their role in nutrition promotion.
Week 2: National and international guidelines and their role in nutrition promotion.
Critical appraisal of the current guidelines
Week 3: Critical appraisal of the current guidelines
Food and health behaviour, models/ theories of health behaviour, food choices,
Week 4: Food and health behaviour, models/ theories of health behaviour, food choices,
Strategies for intervention at the ecological and individual level
Week 5: Concept and objectives of communication for behaviour change
Planning of communication strategies for social and behaviour change programme,
Week 6: Communication needs analysis, stakeholders in nutrition promotion, developing nutrition education plan, identifying communication strategies/ approaches for nutrition and health promotion (e.g. social marketing),
Week 7:Communication needs analysis, stakeholders in nutrition promotion, developing nutrition education plan, identifying communication strategies/ approaches for nutrition and health promotion (e.g. social marketing),
Week 8:Designing nutrition and health messages, selecting communication channels, developing and field testing of communication materials, designing training strategies for trainers and their capacity building.
Week 9: Implementing social and behaviour change communication intervention: an overview
Evaluation of social and behaviour change communication programmes
Week 10 : Meaning, types, tools and techniques, Advocacy planning.
Week 11: Role of advocacy in nutrition policy formulation, preparation of policy briefs
Week 12: Significance of ethics in nutrition and health communication ,Ethical Principles and concerns

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Become Familiar with the concept of Dietary guidelines and their relevance.	Presentations, Discussion	Test on the topic

II	Acquire skills to plan, implement and evaluate behaviour change communication for promotion of nutrition and health among the vulnerable groups.	Presentations, Discussion	Review of related references
III	Develop an understanding of the concept of nutrition advocacy.	Presentations, Discussion	Review and presentation of various examples
IV	Learn the ethics in nutrition and health communication.	Discussion	Assignments

FNEC 45 C: NUTRITION COMMUNICATION FOR HEALTH PROMOTION PRACTICAL

Marks : 50 **Duration : 3 hrs**

Course Objective:
The course aims to enable the students to understand communication strategies for addressing various public health nutrition problems in the community.

Course Learning Outcomes:
The students will be able to:
1. Comprehend communication strategies being used for public health and nutrition programmes in the community.
2. Design communication strategies for addressing a public health nutrition problem in the community.

CONTENTS **PERIODS**

Unit-I **10**

- Planning of communication strategies for public health nutrition problems among vulnerable groups in the community -field testing of messages, materials and methods.

Unit-II **2**

- Review of communication strategies being used in any one public health nutrition programme in the community.

Suggested Readings:

- Robert C. Hornik , (2002) *Public Health Communication: Evidence for behaviour Change,* Lawrence Erlbaum Associates, Inc.
- Ray E.B. and Donohew L. (1990) *Communication and Health: Systems and Applications*. Lawrence Erlbaum Associates, Inc.
- Maibach E. and Parrott R.L. (1995) *Designing health messages: Approaches from Communication Theory and Public Health Practice*. Sage Publications, Inc.

- Boyle M.A. (2016*). Community Nutrition in Action: An Entrepreneurial Approach*. 7th Edition. Brooks Cole.
- Vir S.C. (Ed). (2012) *Nutrition-Health education and communication for improving women and child nutrition. Public Health and Nutrition in Developing Countries (Part II)*.Woodhead Publishing India Pvt. Ltd.
- USAID. *Effective At-Scale Nutrition Social and Behavior Change Communication*. Multi-Sectoral Nutrition Strategy 2014–2025 Technical Guidance Brief.
- McNulty J. (2013*) Challenges and issues in nutrition education*. Rome: Nutrition Education and Consumer Awareness Group, Food and Agriculture Organization of the United Nations. Available at: www.fao.org/ag/humannutrition/nutritioneducation/en/
- USAID (2010) *Behavior Change Communication* (BCC). Learning Resource Package. Facilitator's Guide.
- O'Sullivan, G.A., Yonkler, J.A., Morgan, W., and Merritt, A.P. (2003) *A Field Guide to Designing a Health Communication Strategy*, Baltimore, MD: Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs, March 2003.

FNEC 43 C: FOOD PROCESSING TECHNOLOGY -II

Marks: 100 **Duration: 3 hours**

Course Objectives:
The course aims to provide knowledge of principles and technical aspects of processing of milk and milk products and fruits and vegetable preservation.

Course Learning Outcomes:
Students will be able to:
1. Understand various aspects of processing and quality of milk and milk products.
2. Ingrain the understanding of post-harvest management of fruits and vegetables.
3. Gain in depth knowledge about processing and preservation techniques and quality aspects of fruits and vegetable.

CONTENTS **PERIODS**

Unit I: Milk and Milk Products **23**

- **Introduction to market milk:** Indian standards,Composition, factors affecting composition of milk, physico-chemical properties of milk and its constituents.
- **Milk processing:** Clean milk practices, buying and collection, platform tests, pre-heating, filtration, clarification, standardization, bactofugation, homogenization, pasteurization, cooling, packaging and storage. Cleaning and sanitization of dairy equipment including CIP and COP.
- **Milk products (Cream, butter, ice cream, curd, cheese, khoa and ghee)-**Introduction, definition, classification, methods of manufacture, quality aspects.

Unit II: **Introduction to Fruits and Vegetables** **10**

- **Classification** of fruits and vegetables, general composition, enzymatic browning and its prevention.
- **Post-harvest changes and management of fruits and vegetables-** Climacteric rise, horticultural maturity, physiological maturity, maturity indices and process of ripening-physiological changes, physical and chemical changes. Causes of post-harvest losses, farm heat, measures to reduce post –harvest losses in F & V, Controlled atmosphere storage,

zero energy cool chambers.

Unit III: Preservation of Fruits and Vegetables 10

- **Canning:** Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods**.**
- **Fruit Beverages:** Introduction, Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation), processing of squashes.
- **Jams, jellies and marmalades:** Introduction**,** Jam: Constituents, selection of fruits, processing & technology**,** Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation and defects in jelly**.**
- **Pickles, chutneys and sauces**: Processing, Types, role of ingredients, causes of spoilage in pickling**.**
- **Tomato products:** Selection of tomatoes, pulping & processing of tomato juice, tomato puree, paste, ketchup, sauce and soup**.**

Suggested Readings:

- Siddapa, GS (1986) *Preservation of Fruits and Vegetables*, ICAR Publication
- Van Loesecke HW (1998) *Food Technology Series Drying and Dehydration of foods*. Allie Scientific Publishers
- Salikhe D K and Kadam SS (1995) *Handbook of fruit science and technology. Production Composition, Storage and processing*. Marcel Decker inc, New York
- Marriott N G (1985) *Principles of Food Sanitation* 1st Edition. A VI publication USA.
- De SK (2001) *Outlines of Dairy Technology*, Oxford University Press, New Delhi.

Teaching Plan:

Week 1: Introduction to market milk-Indian standards,Composition, factors affecting composition of milk, Physico-chemical properties of milk and its constituents

Week 2: Milk processing:Clean milk practices, buying and collection, platform tests, pre-heating, filtration, clarification, standardization

Week 3: Bactofugation, homogenization, pasteurization, cooling, packaging and storage. Cleaning and sanitization of dairy equipment including CIP and COP

Week 4: Milk products (Cream, butter, ice cream, curd)-Introduction, definition, classification, methods of manufacture, quality aspects.

Week 5: Cheese, khoa and ghee- Introduction, definition, classification, methods of manufacture, quality aspects.

Week 6: Classification of fruits and vegetables, general composition, enzymatic browning and its prevention

Week 7: Post-harvest changes and management of fruits and vegetables- Climacteric rise, horticultural maturity, physiological maturity, maturity indices and process of ripening-physiological changes, physical and chemical changes.

Week 8: Canning**:** Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods**.**

Week 9: Causes of post-harvest losses, farm heat, measures to reduce post –harvest losses in F & V, Controlled atmosphere storage, zero energy cool chambers.

Week 10: Fruit Beverages**:** Introduction, Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation), processing of squashes.

Week 11: Jams, jellies and marmalades:Introduction**,** Jam: Constituents, selection of fruits, processing & technology. Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation and defects in jelly**.**

Week 12: Pickles, chutneys and sauces: Processing, Types, role of ingredients, causes of spoilage. Tomato products: Selection of tomatoes, pulping & processing of tomato juice, Tomato puree, paste, ketchup, sauce and soup

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Introduction to market milk and processing of milk products	Lectures, discussions and visit to milk industry	• Assignment on milk • Visit report
II	Introduction to fruits and vegetables and post-harvest management	Lectures, discussions based on industrial uses/processing of fruits and vegetables	• Presentation/quiz on fruits and vegetables • Practicals on quality aspects of fruits and vegetables.
III	Learning techniques of preservation of fruits and vegetables	Lectures, discussions	• Presentation • Practicals

FNEC 43 C: FOOD PROCESSING TECHNOLOGY -II PRACTICAL

Marks: 50 **Duration: 3 hours**

Course objective:
The course aims at providing knowledge of processing and preservation principles and techniques pertaining to milk & milk products and fruits & vegetables.

Course learning outcomes:
Students will be able to-

1. Understand technologies used for processing and preservation of milk and milk products and preservation of fruits & vegetable products.
2. Gain practical knowledge of analysing adulterants in milk and quality aspects of milk, milk products and fruits and vegetables.

CONTENTS **PERIODS**

Unit I: Milk and Milk Products **5**

- Quality analysis of milk and determination of its components like fat, SNF, protein, TSS.
- Detection of preservatives in milk (e.g. boric acid and borate).
- Detection of adulterants in milk (like starch, sugar, soda, detergent, urea).
- Analysis of cream, cheese, paneer, khoa as per BIS standards.
- Visit to milk industry to understand process of pasteurization and homogenization.

Unit II: Fruits and Vegetable processing **7**

- Experiment on control of enzyme activity, enzyme inactivation in fruits and vegetables.
- Estimation of acidity, total solids of different foods – Squashes, syrups and juices.
- Dehydration of fruits and vegetables and its effect on colour texture and rehydration ratio.
- New product development using principles of preservation of fruitsand vegetables by low temperature/heat/salt and sugar
- Processing of tomato products (ketchup and sauce).
- Processing of jams, jellies and marmalades.
- Processing of pickles and brines

Suggested Readings:

- Siddapa, G S (1986) *Preservation of Fruits and Vegetables*, ICAR Publication
- Van Loesecke HW (1998) *Food Technology Series Drying and Dehydration of foods*. Allie Scientific Publishers
- Salikhe D K and Kadam S S (1995) *Handbook of fruit science and technology. Production Composition, Storage and processing*. Marcel Decker inc, New York
- Marriott N G (1985) *Principles of Food Sanitation* 1st Edition. A VI publication USA.
- De SK (2001) *Outlines of Dairy Technology*, Oxford University Press, New Delhi

FNEC 44 C: ADVANCED FOOD SCIENCE
THEORY

Marks: 100 **Duration: 3 hours**

Course objective: The course aims to enable students to acquaint with fundamentals of food processing technology and its process and to understand concepts of various engineering principles and processing methods.

Course Learning Outcomes:

Students will be able to-

1. Gain knowledge of principles of Unit operations involved in food processing industry.
2. Learn fundamentals of food processing technology and its process.
3. Understand concepts of various engineering principles and processing and preservation methods and their application.
4. Understand various post processing operations important from industrial point of view.

CONTENTS **PERIODS**

UNIT I: Processing and preservation by heat **18**

Principle, theory and effect of blanching, pasteurization, sterilization, UHT, canning, extrusion

cooking and frying on food.

UNIT II: Processing and preservation by low temperature 18

Principle, theory and effect of refrigeration, chilling, freezing, freeze-drying (lypholization) and freeze-concentration on food.

UNIT III: Processing and preservation by non-thermal technologies 6

- Principle, theory and effect of irradiation, high pressure, pulsed electric field and other innovative technologies on food

.

UNIT IV: Processing and preservation by other methods 6

- Principle, theory and effect on food of drying, osmotic dehydration, concentration, evaporation and distillation, Hurdle technology.

Suggested Readings:

- Branen AL, Davidson PM & Salminen S. (2001) *Food Additives*. 2nd Ed. Marcel Dekker.
- Fellows P J (2002) *Food Processing Technology- Principles and Practices*, 2nd Edition. Woodhead Publishing Ltd.
- Food and Agriculture Organization (1980) M*anual of Food Quality Control, Additive Contaminants Techniques*. Rome.
- Fuller, G.W. (1999) *New Food Product Development. From concept to market place*. CRC press, New York.
- Mahindru, S N (2000) *Food Additives- Characteristics Detection and Estimation*. Tata Mc Graw Hill Publishing Co. Ltd.

Teaching Plan:

Week 1: Principle, theory and effect on food of blanching and pasteurization.
Week 2: Principle, theory and effect on food of sterilization, UHT and canning
Week 3: Principle, theory and effect on food of extrusion cooking and frying
Week 4: Principle, theory and effect on food of refrigeration and chilling
Week 5: Principle, theory and effect on food of freezing and freeze-drying (lyophilization)
Week 6: Principle, theory and effect on food of freeze-concentration
Week 7: Principle, theory and effect on food of irradiation and high pressure
Week 8: Principle, theory and effect on food of pulsed electric field and other innovative technologies.
Week 9: Principle, theory and effect on food of drying
Week 10: Principle, theory and effect on food of concentration and evaporation
Week 11: Revision
Week 12: Presentations

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	The course intends to provide knowledge of principles of Unit operations involved in	Lectures, discussions and visit	• Assignment • Visit report

	food processing industry.		
II	Students will learn fundamentals of food processing technology and its process.	Lectures, discussions	• Presentation/quiz • Practicals.
III	The course will train students to understand concepts of various engineering principles and processing and preservation methods and their application.	Lectures, discussions	• Presentation • Practicals
IV	To understand various post processing operations important from industrial point of view.	Lectures, discussions	• Presentation • Practicals

FNEC 44 C: ADVANCED FOOD SCIENCE PRACTICAL

Marks: 50 **Duration:3 hours**

Course Objectives:
The course enables students to apply knowledge in application of various engineering principles and analysis of food.

Course Learning Outcomes:
Students will be able to-
1. Understand quantitative analysis of food constituents and trace elements
2. Perform food analysis using advanced techniques.

CONTENTS **PERIODS**

UNIT I **4**
- To conduct dehydration and rehydration of fruits and vegetables.
- To study the steps of can making process.
- Estimation of ascorbic acid and effect of heat treatment on it.
- Determination of drying characteristics

UNIT II **4**
- Visit to food processing industry to learn about heat exchangers, freezers, freeze drying and freeze concentration.
- Freezing time calculations.
- Estimation of total acidity, volatile acidity, fixed acidity and esters in alcoholic beverages**.**

UNIT III **4**
- Analysis of water for its potability. Estimation of Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) of industry wastewater
- Estimation of toxins and pesticide residue in foods.

Suggested Readings:

- Girdharilal S, G.S and Tandon, G.L. (1998) *Preservation of fruits & Vegetables*, ICAR, New Delhi
- Crusess WB (2004) *Commercial Unit and Vegetable Products*, W.V. Special Indian Edition, Pub: Agrobios India
- Ranganna S. (1986) *Handbook of analysis and quality control for fruits and vegetable products*, Tata Mc Graw-Hill publishing company limited, 2nd edition.
- Srivastava R.P. and Kumar S. (2006) *Fruits and Vegetables Preservation- Principles and Practices*. 3rd Ed. International Book Distributing Co.
- Potter NH (1998) *Food Science*, CBS Publication, New Delhi.
- Ramaswamy H and Marcotte M. (2003) *Food Processing Principles and Applications* CRC Press.
- Coles R, McDowell D and Kirwan MJ (2003) *Food Packaging Technology*, CRC Press.
- Deman JM (1990) *Principles of Food Chemistry*, 2 nd ed. Van Nostrand Reinhold, NY.

FNEC 45 C: APPLIED FOOD MICROBIOLOGY
THEORY

Marks: 100 **Duration: 3 hrs**

Course Objective:

The course aims to provide knowledge of the microbial flora associated with food, role of microorganisms, microbiological safety of food, food borne pathogens and their toxins.

Course Learning Outcomes:

Students will be able to-

1. Understand the microbial flora associated with food and acquire knowledge on beneficial role of microorganism and relevance of microbiological safety of food.
2. Understand the conventional and rapid methods for detection of food borne pathogens and their toxins.
3. Understand the role of microbes in waste water treatment.

CONTENTS **PERIODS**

UNIT I: Microorganisms associated with Foods **2**

- Bacteria, Fungi, Yeasts and Viruses.

UNIT II: Useful Microorganisms **10**

- Food Cultures, Fermentation, Fermented products and role of microorganisms.
- Cultivation of microorganisms:
  Fermenter design and various types of fermentation systems (submerged, surface and solid state); Fermentation substrates, Principles and production of enzymes, Baker's yeast, vinegar.

UNIT II: Food microbiological quality and safety **18**

- Estimating number of microorganisms.
- ICMSF criteria for microbiological safety of food-Microbiological standards, Microbiological guidelines, Microbiological specifications. Microbiological criteria for various food products.

- ICMSF sampling plan: Two class plan, Three class plan.
- Repair and detection of micro organisms
- Colony counting methods
- Indicators of food quality and food safety-*Coliforms*, *Enterococci*, *Bifidobacteria*, coliphages.
- Psychrotrophic , Thermoduric, Lipolytic, Proteolytic, Halophilic, Osmophilic, Pectinolytic, Acid producing microorganisms: Introduction, general consideration, treatment of sample, equipment, materials, procedure and interpretation.
- Predictive microbiology

UNIT III: Techniques for detection of pathogens associated with food 12

- Analysis of food for detection of *Salmonella* and *E.coli*.
- Rapid methods for detection of food borne pathogens and their toxins:

ATP Photometry, Direct epifluorescent filter technique, Immunological Methods (Immunodiffusion, ELISA), Molecular method (PCR based).

UNIT IV: Waste disposal and Effluent treatment 6

- Identification of waste, Utilization and disposal of industrial wastes.
- Different methods of waste disposal.
- Contemporary technologies for management of waste

Suggested Readings:

- Banwart GJ. (1987) *Basic Food Microbiology* . CBS Publishers and Distributors.
- Frazier WC, Westoff DC. (1998*). Food Microbiology. 4th ed*. Tata McGraw-Hill Publishing Co. Ltd.
- Garbutt J. (1997). *Essentials of Food Microbiology*. Arnold London.
- Jay JM, Loessner DA, Martin J. (2005) *Modern Food Microbiology. 7th ed*. Springer
- Speck, Marvin, (1984). Compendium of Methods for Microbiological examination of Foods. American Public Health Association
- Harry W. Seeley, Paul J. VanDemark (1962). Microbes in action.

Teaching Plan:

Week 1: Microorganisms associated with Foods, Useful Microorganisms.
Week 2: Useful Microorganisms
Week 3: Useful Microorganisms
Week 4: Food microbiological quality and safety
Week 5: Food microbiological quality and safety
Week 6: Food microbiological quality and safety
Week 7: Food microbiological quality and safety
Week 8: Food microbiological quality and safety
Week 9: Techniques for detection of pathogens associated with food
Week 10: Techniques for detection of pathogens associated with food
Week 11: Techniques for detection of pathogens associated with food
Week 12: Waste disposal and Effluent treatment

Facilitating the achievement of Course Learning Outcomes

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
I	Understand the microbial flora associated with food.	Lectures, discussions	• Assignment •
II	Acquire knowledge on beneficial role of microorganism.	Lectures, discussions	• Presentation/quiz • Practicals.
III	Understand the relevance of microbiological safety of food.	Lectures, discussions	• Presentation • Practicals
IV	Understand the conventional and rapid methods for detection of food borne pathogens and their toxins	Lectures, discussions	• Presentation • Practicals
V	Understand the role of microbes in waste water treatment	Lectures, discussions and visit	• Presentation • Practicals • Visit report

FNEC 45 C: APPLIED FOOD MICROBIOLOGY PRACTICAL

Marks: 50 **Duration: 3 hours**

Course Objectives:

The course aims at providing practical understanding of cultivation of microorganisms and study of microorganisms commonly associated with foods and environmental monitoring of a food manufacturing unit.

Course Learning Outcomes:

Students will be able to-

1. Learn techniques of detection of microorganisms from food samples.
2. Understand the method of enumeration of microorganisms and to study different types of microorganisms.

CONTENTS **PERIODS**

UNIT I: Microbial Growth **3**

- Bacterial growth by Turbidometric method.
- Effect of pH and temperature on bacterial growth.
- Grow Brewer's Yeast and its Application in alcohol production.

UNIT II: Detection and Enumeration of Microorganisms associated with Food Samples **8**

- Psychrotrophic , Thermoduric, Lipolytic, Proteolytic, Halophilic, Osmophilic, Pectinolytic, Acid producing microorganisms from different food samples.

UNIT III: Environmental Monitoring and Personnel Hygiene (College canteen/Any manufacturing unit) 3

- Use of swabs, Contact plate, Dip slide, Exposure plate and Phenol co-efficient determination.

Suggested Readings:

- Banwart GJ. (1987) *Basic Food Microbiology* . CBS Publishers and Distributors.
- Frazier WC, Westoff DC. (1998*). Food Microbiology. 4th ed*. Tata McGraw-Hill Publishing Co. Ltd.
- Garbutt J. (1997). *Essentials of Food Microbiology*. Arnold London.
- Jay JM, Loessner DA, Martin J. (2005) *Modern Food Microbiology. 7th ed*. Springer
- Speck, Marvin, (1984). Compendium of Methods for Microbiological examination of Foods. American Public Health Association
- Harry W. Seeley, Paul J. VanDemark (1962). *Microbes in action.*
- Frazier WC and Westhoff DC; Adapted by Vanitha NM. (2014). *Food Microbiology*. 5th edition. McGraw Hill Education (India) Private Limited, New Delhi.