

# **M.Sc. FOOD AND NUTRITION**

**SEMESTER SYSTEM**

**CURRICULUM**

**Department of Home Science**

**UNIVERSITY OF DELHI**

**April, 2010**

## M.Sc. Food and Nutrition Scheme of Examination

### Semester I

Paper No.	Paper	Credits	Periods/Week	Max. Marks	Duration of Exam
1101	Statistics & Computer Applications	4	4	100	3 hours
1111	Advanced Nutritional Biochemistry and Instrumentation I	4	4	100	3 hours
1112	Principles of Food Science	4	4	100	3 hours
1113	Advanced Human Nutrition I	4	4	100	3 hours
1114	<b>Practical:</b> (Advanced Nutritional Biochemistry, Principles of Food Science, Advanced Human Nutrition I)	4	9	100	6 hours each on two days
<b>TOTAL</b>				<b>500</b>	

### Semester II

Paper No.	Paper	Credits	Period /Week	Max. Marks	Duration of Exam
1211	Research Methods & Seminar	4	4	100	3 hours
1212	Advanced Nutritional Biochemistry and Instrumentation II	4	4	100	3 hours
1213	Food Microbiology & Food Safety	4	4	100	3 hours
1214	Advanced Human Nutrition II	4	4	100	3 hours
1215	<b>Practical</b> (Advanced Nutritional Biochemistry & Instrumentation II, Food Microbiology and Food Safety, Advanced Human Nutrition)	4	9	100	6 hours each on two days
<b>TOTAL</b>				<b>500</b>	

## Semester III

Paper No.	Paper	Credits	Period/Week	Max. Marks	Duration of Exam
1311	Core Paper I: Therapeutic Nutrition	4	4	100	3 hours
<b>ANY ONE OF THE FOLLOWING SPECIALIZATION</b>					
1312a	<b>Specialization A</b> Public Nutrition	4	4	100	3 hours
1313a	Institutional Food Management	4	4	100	3 hours
1314a	<b>Practical</b> (Therapeutic Nutrition, Public Nutrition, Institutional Food Management)	4	9	100	6 hours each on two days
1312b	<b>Specialization B</b> Public Health Nutrition	4	4	100	3 hours
1313b	Programme Planning in Public Health Nutrition.	4	4	100	3 hours
1314b	<b>Practical</b> (Therapeutic Nutrition, Public Health Nutrition, Programme Planning in Public Health Nutrition)	4	9	100	6 hours each on two days
1312c	<b>Specialization C</b> Food Processing I	4	4	100	3 hours
1313c	Advanced Food Science I	4	4	100	3 hours
1314c	<b>Practical</b> (Therapeutic Nutrition, Food Processing I, Advanced Food Science I)	4	9	100	6 hours each on two days
1315 (a)	Internship	2	2	50	
1315 (b)	Dissertation	2	2	-	
	<b>TOTAL (for each group)</b>	<b>450</b>			

## Semester IV

Paper No.	Paper	Credits	Period/ Week	Max. Marks	Duration of Exam
<b>ANY ONE OF THE FOLLOWING SPECIALIZATIONS</b>					
<b>1411a</b>	<b>Specialization A</b> Advanced Clinical Nutrition	4	4	100	3 hours
<b>1412a</b>	Challenges in Clinical Nutrition	4	4	100	3 hours
<b>1413a</b>	Entrepreneurship in Food Service	4	4	100	3 hours
<b>1414a</b>	<b>Practical</b> (Advanced Clinical Nutrition, Challenges in Clinical Nutrition, Entrepreneurship in Food Service)	4	9	100	6 hours each on two days
<b>1411b</b>	<b>Specialization B</b> Public Health Aspects of Malnutrition	4	4	100	3 hours
<b>1412b</b>	Programmes & Policies for Food and Nutrition Security	4	4	100	3 hours
<b>1413b</b>	Nutrition Communication for Health Promotion	4	4	100	3 hours
<b>1414b</b>	<b>Practical</b> (Public Health Aspects of Malnutrition, Programmes & Policies for Food and Nutrition Security and Nutrition Communication for Health Promotion)	4	9	100	6 hours each on two days
<b>1411c</b>	<b>Specialization C</b> Food Processing II	4	4	100	3 hours
<b>1412c</b>	Advanced Food Science II		4		3 hours
<b>1413c</b>	Applied Food Microbiology		4	100	3 hours
<b>1414c</b>	<b>Practical</b> (Food Processing II, Advanced Food Science II & Applied Food Microbiology )		9		6 hours each on two days
<b>1415</b>	Dissertation	4	4	150	
	<b>TOTAL (for each group)</b>			<b>550</b>	
	<b>GRAND TOTAL</b>			<b>2000</b>	

**NOTE:**

- **Pass Percentages:** Minimum marks required to pass the examination is 40% in each course, in theory and practical separately. However, the candidates must secure an overall aggregate of 50%.
- The marks obtained in the examination of M.Sc. Semester I and II will be taken into account for the final allotment of the specialization of M.Sc. in III Semester. The concerned Institute will have the discretion to offer one or more specializations in a particular academic session (subject to the availability of logistic support).
- As per the University directive, 25% of the maximum marks of each theory course will be assigned for internal assessment.
- The Practical Examinations shall be conducted over two days, 6 hours each day. 40% of the marks for the practical examination shall be reserved for field work and / or laboratory records of the candidates and will be awarded by the teacher responsible for that course.
- Seminar, Placement Reports and Projects of individual papers will be evaluated by a panel of teachers internally and the marks will be sent to University through the Head of the Department.
- The Dissertation work in Semester III and IV will be marked at the end of Semester IV for 150 marks.
- Each theory paper will have 1 tutorial period per week.

# STATISTICS AND COMPUTER APPLICATIONS(THEORY)

Paper No. : 1101  
Maximum Marks : 100  
Teaching Periods : 4 / Week  
Teaching Load : 50

## OBJECTIVES

- To learn basic statistical procedures for research.
- To understand applications of statistical techniques for analysis and interpretation.
- To use selective software for qualitative and quantitative data analysis.

## CONTENTS

## PERIODS

### PART 1 Statistics

#### **UNIT I Introduction to statistics**

**5**

- Orientation to qualitative and quantitative analysis
- Introduction to quantitative procedures
- Basic principles and concepts in statistics

#### **UNIT II Measurement and computation**

**5**

- Fundamentals of measurement quantity and quality
- Scales of measurement: Nominal, ordinal, interval and ratio
- Reliability, validity and standardization of measurement

#### **UNIT III Organisation and presentation of data**

**5**

- Data reduction strategies
- Coding and tabulation
- Grouping of data: Frequency distribution
- Graphic representation: Graphs, diagrams and charts
- Descriptive statistics and its applications
- Applications of descriptive statistics
- Characteristics of distributions: Skewness, Kurtosis
- Percentage, percentile ranking and frequencies

<b>UNIT IV Probability and normal distribution</b>	<b>5</b>
<ul style="list-style-type: none"><li>• Basic principles and applications of probability</li><li>• Testing hypotheses: Levels of significance and estimation</li><li>• Errors in hypothesis testing: Type I, Type II</li><li>• Sampling, theory, method</li><li>• Z scores, calculation and application</li></ul>	
<b>UNIT V Statistical tests</b>	<b>10</b>
<ul style="list-style-type: none"><li>• Parametric tests of difference: T test, ANOVA and post hoc analysis of significance</li><li>• Parametric tests of association: Pearson's product moment r</li><li>• Non-parametric tests of difference: Mann-Whitney, Sign, Median, and Kruskal –Wallis</li><li>• Non-parametric tests of association: Spearman's r</li><li>• Chi square test</li></ul>	
<b>UNIT VI Regression and prediction</b>	<b>4</b>
<ul style="list-style-type: none"><li>• Regression equation</li><li>• Applications of regression</li></ul>	
<b>UNIT VII Analysis and interpretation</b>	<b>6</b>
<ul style="list-style-type: none"><li>• Guidelines for selecting an appropriate test</li><li>• From scores to conclusions</li></ul>	
<b>UNIT VIII Computer Applications Software</b>	<b>10</b>
<ul style="list-style-type: none"><li>• EXCEL</li><li>• SPSS</li><li>• Atlas.ti</li></ul>	

## RECOMMENDED READINGS

- Argyrous, G. (2000). *Statistics for Social and Health Research*. London: Sage.
- Bernard, H.R. (2000). *Social Research Methods: Qualitative and Quantitative Approaches*. Thousand Oaks, Ca: Sage.
- Minium, E.W., King, B.M., & Bear, G. (1995/2004). *Statistical Reasoning for Psychology and Education*. New York: Wiley and Sons.
- Mujis, D. (2004). *Doing Quantitative Research in Education with SPSS*. London: Sage.
- Salkind, N. (2000). *Statistics for People Who (they think) Hate Statistics*. London: Sage.



## ADVANCED NUTRITIONAL BIOCHEMISTRY AND INSTRUMENTATION – I (Theory)

**Paper No.** : 1111  
**Maximum Marks** : 100  
**Teaching Periods** : 4 Periods/Week  
**Teaching Load** : 48 Periods/ Semester

### OBJECTIVES

- To augment the biochemistry knowledge acquired at the undergraduate level.
- To understand the mechanisms adopted by the human body for regulation of metabolic pathways.
- To get an insight into interrelationships between various metabolic pathways.
- To understand the principles and use of Instruments used for biochemical analysis.
- To become proficient for specialization in nutrition.

### CONTENTS

### PERIODS

#### UNIT I CARBOHYDRATES, LIPIDS AND THEIR REGULATION 15

##### Carbohydrates

- Glycolysis.
- Gluconeogenesis
- Hexose monophosphate shunt.
- Citric acid cycle.

##### Lipids

- Fatty acids – synthesis of saturated and unsaturated
- Triacylglycerols – synthesis
- Phospholipids – synthesis
- Lipoproteins – synthesis
- Cholesterol – synthesis and regulation

12

#### UNIT II HORMONES

##### Mechanism of action of hormones

- Target cell concept.
- Receptors.
- Classification of hormones.
- Signal transduction.
- Intracellular messengers.

10

### **UNIT III Instrumentation in Nutritional Biochemistry**

- (a) Basic principles of spectrophotometry. **6**
- Beer Lambert`s law.
  - Colorimetry.
  - Atomic absorption.
  - Flame photometry.
- (b) Basic principle of following techniques. **5**
- Gel filtration.
  - Ion exchange chromatography.
  - Affinity chromatography.
  - HPLC.
  - Gas chromatography.

### **RECOMMENDED READINGS**

- BergJM, Tymoczko JL and Stryer L. (2002) Biochemistry 5<sup>th</sup> ed. W.H. Freeman.
- Devlin TM. (2002) Text Book of biochemistry with Clinical Correlations 5<sup>th</sup> ed. John Wiley and Sons.
- Horton RH, Moran LA, Ochs RS, Rawn JD and Scrimgeour.(2002) Principles of Biochemistry 3<sup>rd</sup> ed. Prentice Hall.
- Murray RK, Granner DK, Kayes PA and Rodwell VW.(2003) Harper`s Illustrated Biochemistry. 26<sup>th</sup> ed. McGraw-Hill. Asia.
- Voet D and Voet JG. (2004)Biochemistry. 3<sup>rd</sup> ed. John Wiley and Sons.

# PRINCIPLES OF FOOD SCIENCE

Paper No.	:	1112
Maximum Marks	:	100
Teaching Periods	:	4 /week
Teaching Load	:	48 periods per Semester

## OBJECTIVES

- To have coherent and systematic knowledge and understanding of chemistry of food components like proteins, carbohydrates and lipids.
- To understand the various aspects of food product development
- To be able to interpret food laws, standards and regulations governing food processing, production, marketing and safety.

## CONTENTS

## PERIODS

### UNIT 1: Food Chemistry

26

- **Water:** Definition of water in foods, structure, water activity, phase diagram of water, phase transition of food containing water, relation between water activity, temperature and WLF equation, 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 and Enzymes:** Iso-electric points of proteins, proteins as enzymes in food system, its nature, stability and action, proteolysis, application of enzymes and immobilized enzymes.
- **Sugars:** Composition and properties of different types of sugars, their application in food systems, crystallization, caramalization, Maillard reaction and its industrial application.
- **Lipids:** Properties of fats, functional properties of fats and oils, fat stabilizers, fat deterioration and antioxidants, interesterification of fats.

### UNIT II: Basic concepts of new product development

12

- Market research, consumer dynamics, process of product development and standardization, sensory evaluation, packaging, labelling and marketing of new food products.

### **UNIT III: Food safety laws and standards**

**10**

- Hazard Analysis and Critical Control Points (HACCP), Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), International Organisation for Standardization (ISO), Essential Commodities Act, Codex Alimentarius, World Trade Organisation (WTO), Technical Barrier to Trades (TBT), Sanitary Phyto-Sanitary (SPS) rules, Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Act, 2006 (FSSA): Prevention of Food Adulteration Act (PFA), Milk and Milk Products Order (MMPO), Meat Food Products Order (MFPO), Fruits Products Order (FPO).

### **RECOMMENDED READINGS:**

- Bureau of Indian standards: Specifications and standard methods. Volume I to XII.
- Fellows P J (2002), Food Processing Technology- Principles and Practices, 2<sup>nd</sup> 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.
- Graf E and Saguy I S, (1991) Principles and practices for the safe processing of foods. Butterw Heinemann Ltd., Oxford.
- Mahindru, S N (2000) Food Additives- Characteristics Detection and Estimation. Tata Mc Graw Hill Publishing Co. Ltd.

## ADVANCED HUMAN NUTRITION – I (Theory)

Paper No.	:	1113
Maximum Marks	:	100
Teaching Periods	:	4 /week
Teaching Load	:	48 periods per semester

### OBJECTIVES

- To understand the historical perspective of nutrient requirements.
- To learn to critically evaluate the methodology and derivation of requirements for specific macronutrients.
- To appreciate importance of nutrition immunity interactions and their implications.
- To learn various measures for enhancing nutritional quality of diets.
- To stay updated with emerging concepts in nutrition.

### CONTENTS

### PERIODS

#### **UNIT I: Human Nutrient Requirements –Macronutrients** **24**

- Historical perspective of nutrient requirements
- Methods of assessment of nutrient needs – a critical review
- Critical evaluation of sensitive methods and derivations of requirements and recommended dietary allowances of macronutrients for all age groups:
  - Energy
  - Carbohydrates and dietary fibre
  - Proteins and amino acids
  - Lipids
  - Water

Critical evaluation of national and international nutrient allowances; factors affecting the requirements.

#### **UNIT II: Interactions of Nutrition, Immunity and Infection** **10**

- 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 susceptibility to infections.
- Operational implications.

### **UNIT III: Improving Nutritional Quality of Diets**

**8**

- Ways of enhancing nutritional quality of diets.
- Assessment of protein quality.
- Dietary diversification.
- Bioavailability of nutrients.
- Nutrient losses during cooking and processing.

### **UNIT IV: Emerging Concepts in Human Nutrition**

**6**

- Ongoing nutrition transition and its implications.
- Changing trends in life style patterns in population groups and their implications.
- Nutrigenomics, nutraceuticals, bioactive compounds.

### **RECOMMENDED READINGS**

- ICMR (1990). Nutrient Requirements and Recommended Dietary Allowances for Indians.
- FAO/WHO/UNU (2004). Human Energy Requirements. Report of a Joint Expert Consultation.
- WHO (2007). Protein and Aminoacid Requirements in Human Nutrition. Report of a joint WHO/FAO/UNU expert consultation. WHO Technical Report Series 935.
- Bamji M.S., Rao N.P., Reddy V. Eds. (2009). Textbook of Human Nutrition. 3<sup>rd</sup> Edition. Oxford and IBH Publishing Co. Pvt. Ltd.
- Nutrition in Developmental Transition. NFI-WHO (SEARO) Symposium. NFI (2006).

## **PRACTICAL**

**Paper No** : 1114  
**Maximum Marks** : 100  
**Practical** : 3 Practicals/week (3 periods/practical)  
**Practical load** : 36 practical/ semester  
per semester

### **a. ADVANCED NUTRITIONAL BIOCHEMISTRY AND INSTRUMENTATION - I**

#### **OBJECTIVES:**

- To understand the use of colorimetry in biochemical estimations.
- To detect the purity of samples by using biochemical techniques.

#### **CONTENTS**

#### **PRACTICALS**

##### **Unit I Spectrophotometry**

**8**

- Estimation of Phosphorous
- Estimation of Proteins.
- Estimation of Iron.
- Estimation of Cholesterol.
- Determination of blood glucose – oxidase method.
- Estimation of Vitamin-C.

##### **Unit II Chromatographic Techniques**

**2**

Separation of amino acids, sugars and lipids.

##### **Unit III Blood Analysis**

**2**

#### **RECOMMENDED READINGS**

- A manual of laboratory techniques edited by Raghuramulu N. Madhavan Nair K. and Kalyansundaram S. NIN ICMR 1983.
- Fiske C and Subba Rao Y. the colorimetric determination of Phosphorous J. Biol. Chem. 1925.
- Fundamentals of clinical chemistry edited by Tietz NW WB Saunders Co. 1976.
- Hawk's Physiological Chemistry. Edited by Oser B.L. McGraw-Hill Book Co. 14<sup>th</sup> ed. 1965.
- Instrumental methods of chemical analysis by Sharma BK Goel Publishing house 8<sup>th</sup> ed. 1986.
- Organic Laboratory Techniques, 3<sup>rd</sup> Ed. Fessenden, Fessenden, Feist Brooks/Cole, 2000.
- Practical clinical biochemistry. Varley H. Gowenlock. A. H. and Bell M. William Heinemann medical books limited. Vol. 1. 5<sup>th</sup> 3d. 1980.

## **B. PRINCIPLES OF FOOD SCIENCE**

### **OBJECTIVES**

- To learn quality control of raw and processed food products.
- To conduct physical, chemical and nutritional analysis of commonly consumed raw and processed foods with or without additives.

### **CONTENTS**

### **PRACTICALS**

#### **UNIT I Food Chemistry**

**2**

1. Proximate composition of foods: Analysis of carbohydrates, proteins, fats, total ash, moisture content. **1**
2. Estimation of sugar in foods. **1**
3. Determination of active alcoholic and aqueous acidity in foods, measurement of pH and preparation of buffer solutions. **1**
4. Refractive index, melting point, solidification point of fats & oils. **1**
5. Determination of peroxide value and acid value in fats & oils. **2**
6. Estimation of polyphenols in foods. **1**
7. Determination of ascorbic acid/dehydroascorbic acid ratio in foods. **1**

#### **UNIT II : Basic concepts of new product development**

New Product Development and its package design & labelling and sensory evaluation. **3**



## RECOMMENDED READINGS

- Bureau of Indian standards: Specifications and standard methods. Volume I to XII.
- Fellows P J (2002), Food Processing Technology- Principles and Practices, 2<sup>nd</sup> 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.
- Graf E and Saguy I S, (1991) Principles and practices for the safe processing of foods. Butterw Heinemann Ltd., Oxford.
- Mahindru, S N (2000) Food Additives- Characteristics Detection and Estimation. Tata Mc Graw Hill Publishing Co. Ltd.

## c. ADVANCED HUMAN NUTRITION I

### OBJECTIVES

- To learn the techniques of measuring energy expenditure in individuals
- To be able to assess the protein quality of diets and dishes
- To be able to conduct nutrient balance studies

CONTENTS	PRACTICALS
<b>UNIT I: Energy Expenditure</b>	<b>4</b>
<ul style="list-style-type: none"><li>• Oxygen consumption measurements / Heart rate measurements.</li><li>• Computing energy expenditure and energy balance.</li></ul>	
<b>UNIT II: Assessment of Protein Quality</b>	<b>4</b>
<ul style="list-style-type: none"><li>• By various indices and their interpretation.</li><li>• Calculation of NDpCal % of diets and dishes.</li></ul>	
<b>UNIT III: Human Balance Studies</b>	<b>3</b>
<ul style="list-style-type: none"><li>• Nitrogen balance.</li><li>• Mineral balance: Ca/Fe/Zn.</li></ul>	
<b>UNIT IV: Field Visits</b>	<b>1</b>
<ul style="list-style-type: none"><li>• To institutions conducting research in human nutrition and report writing of the visits</li></ul>	

## RECOMMENDED READINGS

- ICMR. A Manual of Laboratory Techniques.
- WHO (2007). Protein and Amino acid Requirements in Human Nutrition. Report of a joint WHO/FAO/UNU expert consultation. WHO Technical Report Series 935.
- Gibney MJ, Margetts BM, Kearney JM, Arab L (2004). Public Health Nutrition. The Nutrition Society. Blackwell Publishing, Oxford, UK.
- Sundararaj P, Siddhu A (2006). Qualitative tests and quantitative procedures in Biochemistry- A Practical Manual. Third edition. Elite Publishers, New Delhi.
- AOAC (1997). Official Methods of analysis. 16<sup>th</sup> edition. Association of official Analytical Chemists.

## **SEMESTER II**

### **RESEARCH METHODS AND SEMINAR**

<b>Paper No.</b>	:	<b>1211</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Teaching Periods</b>	:	<b>4 Periods/Week</b>
<b>Teaching Load</b>	:	<b>48 Periods/ Semester</b>

#### **OBJECTIVES**

- To understand the scientific approaches to research
- To understand the significance of research methods in food and nutrition
- To identify the sources of variability and uncertainty in research.
- To appreciate the importance of scientific writing and develop competence in writing skills.
- To draft a research proposal and write a scientific paper.

#### **CONTENTS**

#### **PERIODS**

##### **Unit I OBJECTIVES OF RESEARCH**

**4**

Definition, objectives, types of research, quantitative and qualitative research in food and nutrition.

##### **Unit II BASIC PRINCIPLES OF RESEARCH DESIGN**

**6**

- Meaning and need
- Types of research designs – exploratory, descriptive, experimental, survey and case study, cross-sectional and longitudinal
- Study design issues, sampling methods and sample size.

##### **Unit III INSTRUMENTS OF DATA COLLECTION**

**5**

- Observation, questionnaire, interview : reliability and validity of measuring instruments
- Data management and quality control

##### **Unit IV RESEARCH STRATEGIES IN FOOD AND NUTRITION**

**8**

Issues in design, conduct, analysis and interpretation

- descriptive studies (correlation, case studies, cross-sectional surveys)
- analytical studies (observational, case-control, cohort studies – prospective and retrospective)
- experimental studies (clinical / intervention trials including randomized controlled trials)

- rapid assessment procedures in food and nutrition research : use of rapid assessment procedures for nutrition program planning and evaluation

**Unit V Ethics in nutrition research** **2**

**Unit VI Formulation of research design / proposal** **5**

**Unit VII Scientific writing as a means of communication** **6**

- Different forms – research articles / notes, review articles, monographs, dissertations and reports
- Components of dissertation / research report / article
- Importance of illustrations
- Methods of presenting research findings – oral / poster

**Unit VIII Seminar** **12**

Preparation of Seminar and presentation

### **RECOMMENDED READINGS**

- Best, JW and Kahn, JV (1992) Research in Education.6<sup>th</sup> ed. New Delhi, Prentice Hall of India Pvt. Ltd,.
- Kothari, CR (2004) Research Methodology, Methods & Techniques, 2<sup>nd</sup> ed. New Age International Publishers.
- Goode, WJ and Hatt, PK (1981) Methods in Social Research, McGraw Hill International Editions, Sociology Series.
- Kerlinger, FN (1983) Foundations of Educational Research. 2<sup>nd</sup> ed.
- Marjory L. Joseph, William D Joseph (1996) Research Fundamentals in Home Economics / Human Ecology. Plycon Press.
- WHO (2001) Health Research Methodology – A Guide for Training in Research Methods.
- Stennberg, R J (1991) The Psychologist's Companion : A Guide to Scientific Writing for students and Researchers. Cambridge: CUP.
- Scrimshaw NS and Gleason GR: Rapid Assessment Procedures, Qualitative Methodologies for Planning and Evaluation of Health Related Programmes. International Nutrition Foundation for Developing Countries, Boston.
- Cresswell J : Research Design : Qualitative and quantitative Approaches Thousand Oaks CA, Sage Publications.

## **ADVANCED NUTRITIONAL BIOCHEMISTRY AND INSTRUMENTATION- II (Theory)**

<b>Paper No.</b>	<b>:</b>	<b>1212</b>
<b>Maximum Marks</b>	<b>:</b>	<b>100</b>
<b>Teaching Periods</b>	<b>:</b>	<b>4 Periods/Week</b>
<b>Teaching Load</b>	<b>:</b>	<b>48 Periods/ Semester</b>

### **OBJECTIVES**

- To understand the basics of genetic material.
- To get familiar with the latest developments in genetic engineering.
- To understand the principles and use of instruments used for protein DNA and radioactive isotopes.

### **UNIT I Nucleotides**

- Structure. **4**
- Biosynthesis and breakdown of purine and pyrimidine nucleotides. **4**

### **Nucleic acids**

- DNA organization, replication and repair. **6**
- RNA synthesis and processing (in prokaryotes and eukaryotes)
- Regulation of gene expression(lac operon) **2**

### **Proteins**

- Genetic code. **8**
- Translation
- Post translational modification.
- Genetic mutations.

### **UNIT II Genetic recombination and nutrigenomics**

- Elementary knowledge of DNA recombinant technology. **12****
- Restriction enzymes.
  - Chimeric DNA.
  - Cloning.
  - Genomic library and cDNA library.
  - Basic principles of nutrigenomics

Basic principles of :

- Electrophoresis-Polyacrylamide gel eletrophoresis (Native and SDS), Agarose gel electrophoresis.
- pH meter.
- Radioisotopes and their application

**RECOMMENDED READINGS**

- Berg JM, Tymoczko JL and Stryer L. (2002) Biochemistry 5<sup>th</sup> ed. W.H. Freeman.
- Conn EC, Stumpf PK, Bruening G and Doi RH (2001) Outlines of Biochemistry. 5<sup>th</sup> ed. John Wiley and Sons (Asia).
- Devlin TM. (2002) Text Book of biochemistry with Clinical Correlations 5<sup>th</sup> ed. John Wiley and Sons.
- Horton RH, Moran LA, Ochs RS, Rawn JD and Scrimgeour.(2002) Principles of Biochemistry 3<sup>rd</sup> ed. Prentice Hall.
- Murray RK, Granner DK, Kayes PA and Rodwell VW. (2003) Harper's Illustrated Biochemistry. 26<sup>th</sup> ed. McGraw-Hill. Asia.
- Nelson DL and Cox MM. (2005) principles of Biochemistry. 4<sup>th</sup> ed. Freeman and Company.
- Voet D and Voet JG. (2004)Biochemistry. 3<sup>rd</sup> ed. John Wiley and Sons.

# FOOD MICROBIOLOGY AND FOOD SAFETY

Paper No : 1213  
Maximum Marks : 100  
Teaching Periods : 4/week  
Teaching Load : 48 periods/semester

## OBJECTIVES

- To understand the nature of microorganisms involved in food spoilage, food infections and intoxications and also those used in food biotechnology (food fermentation and various food processing industries)
- To gain knowledge of principles of various techniques used in the prevention and control of the microorganisms in foods (food preservation)
- To understand criteria for microbiological safety in various foods operations to avoid public health hazards due to food contamination

## CONTENTS

## PERIODS

### UNIT I: Overview of Basic Microbiology

- Definition, Scope of Food Microbiology 1
- An introduction to microbial world: Bacteria, Fungi, Yeast, Viruses
  - 1. **Bacterial groups based on their morphology:** Gram +ve/Gram -ve bacteria, Motile/Non-motile bacteria, Sporulating/Non-sporulating bacteria 2
  - 2. **Bacterial groups based on their physiological growth factors:** Temperature, pH, water activity, availability of oxygen. 2
- **Fungi and Yeast:** General features & their importance in food Microbiology 1
- **Viruses and Bacteriophages:** Definition, their general characteristics & multiplication. 1

### UNIT II: Food Spoilage and Preservation

- **Food spoilage:** Definition, sources of contamination and microorganisms involved in spoilages of various foods: Milk, Bread, Canned food, Vegetables and fruits, Fruit juices, Meat, Eggs and Fish 12
- Physical and chemical means used in destruction of microbes: Definition of sterilization and disinfection, role of heat, filtration and radiation in sterilization, use of chemical agents-alcohol, halogens and detergents 7

### **UNIT III: Microorganisms in Human Welfare**

- Importance of microbes in food biotechnology: genetically engineered organisms, probiotics and single cell proteins. **4**
- Dairy products (cheese and yoghurt) and traditional Indian fermented foods and their health benefits. **2**

### **UNIT IV: Food safety and Quality Control**

- Public health hazards due to microbial contamination of foods: Important food borne infections and intoxications due to bacteria, moulds, viruses (*Salmonella typhi*, *Helicobacter pylori*, *Campylobacter jejuni*, *Yersinia enterocolitica*, *Bacillus cereus*, *Staphylococcus aureus*, *Clostridium botulinum*, *Escherichia coli*, *Mycotoxins*, *Hepatitis A virus* & *Rota virus*)-Symptoms, mode of transmission and methods of prevention. **12**
- Assessing the microbiological quality of food: indicator organisms, microbiological standards, principles of GMP & HACCP in food processing. Safety management at household and industrial level. **4**

### **RECOMMENDED READINGS**

- Banwart GJ.(1987) *Basic Food Microbiology* . CBS Publishers and Distributors.
- Frazier WC, Westoff DC.(1998)*Food Microbiology*. 4<sup>th</sup> ed. Tata McGraw-Hill Publishing Co. Ltd.
- Garbutt John (1997) *Essentials of Food Microbiology*. Arnold London.
- Jay JM, Loessner DA, Martin J.(2005) *Modern Food Microbiology*. 7<sup>th</sup> ed. Springer
- Pelczar MJ, Chan ECS, Krieg N. (1993) *Microbiology*. 5<sup>th</sup> ed. Tata McGraw-Hill Publishing Co. Ltd.
- Prescott LM, Harley JP, Klein DA.(2008) *Microbiology*. 6<sup>th</sup> ed. WMC Brown Publishers.



## ADVANCED HUMAN NUTRITION II

<b>Paper No.</b>	:	<b>1214</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Teaching Periods</b>	:	<b>4 /week</b>
<b>Teaching Load</b>	:	<b>48 periods per Semester</b>

### **OBJECTIVES**

- To learn to critically evaluate the methodology and derivation of requirements for specific micronutrients.
- To understand nutritional management in special conditions.
- To understand critical periods in growth and development and impact of malnutrition on it.
- To understand the various methods of assessment of nutritional status.

### **CONTENTS**

### **PERIODS**

<b>UNIT I: Human Nutrient Requirements - Micronutrients</b>	<b>20</b>
Critical evaluation of sensitive methods and derivations of requirements and recommended dietary allowances of micronutrients for all age groups: <ul style="list-style-type: none"><li>- Water soluble vitamins</li><li>- Fat soluble vitamins</li><li>- Minerals and trace elements</li></ul>	
Critical evaluation of national and international nutrient allowances; factors affecting the requirements, dietary guidelines for Indians.	
<b>UNIT II: Nutrition in Special Conditions</b>	<b>6</b>
<ul style="list-style-type: none"><li>• Extreme temperatures - low and high</li><li>• High altitude</li><li>• Space nutrition and food systems</li><li>• Sports nutrition</li></ul>	
<b>UNIT III: Assessment of Nutritional Status</b>	<b>10</b>
<ul style="list-style-type: none"><li>• Critical overview of various methods of nutritional assessment.</li><li>• Detailed methodology of the various techniques and interpretation of results.</li><li>• National and International Growth Standards/References</li><li>• National Nutrition Surveys – NNMB, NFHS, DLHS</li></ul>	
<b>UNIT IV: Growth and Development through the Life Cycle</b>	<b>12</b>
<ul style="list-style-type: none"><li>• Different aspects of growth – cellular to physical</li><li>• Malnutrition and cognitive development</li><li>• Determinants of growth and development</li><li>• Impact of altered nutrition on growth and development</li><li>• Maternal malnutrition and pregnancy outcome</li><li>• Changes in body composition throughout the life cycle.</li><li>• Alterations in body composition and their consequences.</li></ul>	

## RECOMMENDED READINGS

- Bamji M.S., Rao N.P., Reddy V. Eds. (2009). Textbook of Human Nutrition. 3<sup>rd</sup> Edition. Oxford and IBH Publishing Co. Pvt. Ltd.
- ICMR (1990) Nutrient Requirements and Recommended Dietary Allowances for Indians.
- FAO/WHO. (2004) Vitamin and Mineral Requirements in Human Nutrition. Report of a Joint Expert Consultation.
- Gibson R S. (2005) Principles of Nutritional Assessment. 2<sup>nd</sup> ed. Oxford University Press.
- WHO (1995). Physical Status: The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee. WHO Tech Rep Series 854.
- WHO (2006). WHO Child Growth Standards.

# **PRACTICAL**

Paper No	:	1215
Maximum Marks	:	100
Practical	:	3/week (3 periods/practical)
Practical load	:	36 practical per semester

## **a. ADVANCED NUTRITIONAL BIOCHEMISTRY AND INSTRUMENTATION II**

### **OBJECTIVES**

- To understand various methods of quantitative estimations of biomolecules.
- To learn the basic analytical techniques used for genetic engineering

### **CONTENTS**

<b>Unit I. Buffers</b>	<b>4</b>
• Preparation of acidic buffers.	
• Preparation of basic buffer	
<b>Unit II Spectrophotometry</b>	<b>4</b>
• DNA estimation.	
• RNA estimation.	
• Enzyme assay.	
<b>Unit III. Electrophoresis</b>	<b>4</b>
• Agarose gel electrophoresis	
• SDS polyacrylamide gel electrophoresis.	

### **RECOMMENDED READINGS**

- A manual of laboratory techniques edited by Raghuramulu N. Madhavan Nair K. and Kalyansundaram S. NIN ICMR 1983.
- A text book of quantitative inorganic analysis. Vogel AI The English Language book society and Longman 3<sup>rd</sup> edition 1962.
- Fiske C and Subba Rao Y. the colorimetric determination of Phosphorous J. Biol. Chem. 1925.
- Hawk's Physiological Chemistry. Edited by Oser B.L. McGraw-Hill Book Co. 14<sup>th</sup> ed. 1965.

- King Ej and Wootton IDP. Micro-analysis in medical biochemistry J& A Churchill Ltd. London 3<sup>rd</sup> ed. 1956.
- Practical clinical biochemistry. Varley H. Gowenlock. A. H. and Bell M. William Heinemann medical books limited. Vol. 1. 5<sup>th</sup> 3d. 1980.

## **b. FOOD MICROBIOLOGY AND FOOD SAFETY**

### **OBJECTIVES**

- **To familiarize with the techniques used for cultivation and purification of microbes**
- **To know the methods used for quality check of food and water**
- **To know the techniques used for identification of different pathogenic microbes**

### **CONTENTS**

### **PERIODS**

**UNIT I:** To study morphology and structural features of various bacteria and fungi commonly associated with Foods. **3**

**UNIT II:** Isolation of microorganisms by Pure Culture Technique and Microbial count by Standard Plate Count Method. **3**

**UNIT III:** Microbiological analysis of Water, Milk, Canned product, Fruit juices and Street foods. **3**

**UNIT IV:** Use of Biochemical tests for identifying bacteria. **3**

### **RECOMMENDED READINGS**

- Bell C, Neaves P, Williams AP.(2006) *Food Microbiology and Lab Practice*.
- Yousef AL (2003). *Food Microbiology. A Laboratory Manual*. Wiley Interscience New Jersey.
- Cappuccino JG, Sharman N(2002). *Lab Manual of Microbiology*. Pearson Education Publishing Co.
- Benson HJ (1990). *Microbiological Application.5<sup>th</sup> ed*. WMC Brown Dubugue.

## **c. ADVANCED HUMAN NUTRITION II**

### **OBJECTIVES**

- To learn techniques used in nutrient analysis of foods.
- To develop competence in assessment of nutritional status of individuals and groups.

### **CONTENTS**

### **PRACTICALS**

**UNIT I: Estimation of Nutrients in Foods: Vit A/Vit E/Fe/ Zn** **4**

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

- Dietary surveys, anthropometry and body composition, biochemical and clinical methods.
- Stress scale (Standard), personality test (MMPI), cognition tests.
- Standardization of tools and techniques

**UNIT III: Field Visits** **1**

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

### **RECOMMENDED READINGS**

- Gibson R S. (2005). Principles of Nutritional Assessment. 2<sup>nd</sup> ed. Oxford University Press.
- Cameron N. (1984). The measurement of Human Growth. Croom Helm Ltd. London and Sydney.
- 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/>

## **SEMESTER III**

### **THERAPEUTIC NUTRITION (Theory)**

<b>Paper No.</b>	:	<b>1311</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Teaching Periods</b>	:	<b>4/ week</b>
<b>Teaching Load</b>	:	<b>48 periods / Semester</b>

#### **OBJECTIVES**

- **To understand causative factors and metabolic changes in various disease/disorders**
- **To gain knowledge of the principles of diet therapy**
- **To learn principles of dietary counseling**
- **To understand the rationale of prevention of various diseases/disorders**

#### **CONTENTS**

#### **PERIODS**

##### **UNIT I NUTRITIONAL ASSESSMENT & CARE OF PATIENTS**

a) Nutrition care process	<b>4</b>
- Nutrition care process	
- Nutritional screening and assessment of patients – out patient & hospitalized	
- Nutritional interpretation of routine medical and laboratory data	
- Nutrition care plan and implementation	
- Monitoring and follow up	
- Ethical issues	
b) Dietary Counseling	<b>2</b>
c) Nutrition Support: Enteral Nutrition	<b>3</b>

##### **UNIT II WEIGHT MANAGEMENT & DIABETES MANAGEMENT**

Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications, treatment, MNT, dietary counseling and recent advances in

a) Weight imbalance disorders – Overweight and Underweight	<b>7</b>
b) Diabetes Mellitus – Type 1, Type 2 and Gestational diabetes	<b>8</b>

### **Unit III CARDIOVASCULAR DISORDERS & GI TRACT DISORDERS**

Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications, treatment, MNT, dietary counseling and recent advances in

- a) Cardio Vascular Diseases – hypertension, hyperlipidemia, metabolic syndrome, peripheral and cerebro vascular disease **9**
- b) Gastrointestinal tract Disorders – GERD, peptic ulcer, diarrhoea, lactose intolerance, celiac disease **6**

### **Unit IV OVERVIEW OF SOME DEGENERATIVE DISORDERS**

- a) Cancer - Role of diet in etiology and management **4**
- b) Alzheimer's disease and Parkinson's disease **2**
- c) HIV-AIDS **3**

### **RECOMMENDED READINGS**

- Mahan, L. K. and Escott Stump. S. (2008) *Krause's Food & Nutrition Therapy 12<sup>th</sup> ed.* Saunders-Elsevier
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease. 10<sup>th</sup> ed.* Lipincott, William and Wilkins.
- Gibney MJ, Elia M, Ljungqvist & Dowsett J. (2005) *Clinical Nutrition.* The Nutrition Society Textbook Series. Blackwell Publishing Company.
- 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.
- Lee RD & Neiman DC. (2009). *Nutritional Assessment.. 5<sup>th</sup> edition.* Brown & Benchmark.

# SPECIALIZATION A

## PUBLIC NUTRITION

Paper No.	:	1312 (a)
Maximum Marks	:	100
Teaching Period	:	4 periods/ week
Teaching Load	:	48 periods

### OBJECTIVES

- To understand the concept of Public Nutrition.
- To understand the national health care delivery System.
- To understand the causes and consequences of nutritional problems in the community.
- To orient the students with the strategies for improving the nutritional status of communities.
- To understand the concept of food and nutrition security.
- To learn about the various Government programmes aimed at improving health and nutritional status of the population.
- 

### CONTENTS

### PERIODS

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

**12**

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

#### **UNITII: Public Health Aspects of Under nutrition**

**12**

Etiology, public health implications, preventive/curative strategies for CED/PEM and micronutrient deficiencies of public health significance.

#### **Unit III: Approaches/ Strategies for Improving Nutrition and Health Status of the Community**

**12**

- Health based interventions including immunization, provision of safe drinking water/ sanitation, prevention and management of diarrhoeal diseases
- 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 IV: Food and Nutrition Security- Public Sector Programme** **12**

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

**RECOMMENDED 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 practices. Jones and Barlett Publishers.
- Park, K. (2009) Park's Textbook of Preventive and Social Medicine, 20<sup>th</sup> ed. Jabalpur M/s. Banarsidas Bhanot.

## INSTITUTIONAL FOOD MANAGEMENT

Paper No.	:	1313 (a)
Maximum Marks	:	100
Teaching Period	:	4 periods/ week
Teaching Load	:	48 periods

### OBJECTIVES

- To develop a knowledge base about the different types of Food service units and its evolution
- To impart necessary expertise to function as a food service manager
- To provide practical experience in managing food material for food service management
- To equip individuals to understand and manage human resource

### CONTENTS

### PERIODS

#### UNIT I HISTORICAL PERSPECTIVE OF FOOD SERVICE

- Evolution of the food service industry 2
- Kinds of food service systems 2  
Conventional, commissary, ready prepared, assembly/serve

#### UNIT II Management & Organisation

2

- **Management Theories**  
Classical, Scientific, Behavioral, Systems approach, Contingency approach, MBO, JIT, TQM
- **Managerial operations** 2
  - a) Functions of management /manager
  - b) Principles of management
  - c) Definition of Organization and steps in organizing
- **Tools of Management** 8
  - a) Tangible Tools: Organization chart, Job description, Job specification, Job analysis: Path way chart, Process chart, Work schedule, Production schedule, Staff and service analysis, Budget
  - b) Intangible tools: Communication, Leadership, Decision making

### UNIT III: MATERIAL MANAGEMENT

18

- a) Menu planning: Functions, Factors affecting menu planning, Menu construction, Types of menu, Menu card, Qualifications of menu planners
- b) Purchase:– Market, Buyer, Vendor, Methods of Purchase: Formal and Informal, Purchasing procedure
- c) Storage: Types of storage, Store room requirement, Appropriate temperature for storage of different foods, Storeroom Records
- d) Food production:  
Production planning and control: Importance of planning, Production forecast, Estimating quantities to buy Quantity preparation techniques  
Production schedule Product evaluation, Standardization of recipes, Recipe adjustments and portion control
- e) Food delivery and service: Centralized and decentralized, factors affecting selection , Styles of service, delivery and service equipments.

### UNIT IV: MANPOWER MANAGEMENT

14

- **Manpower Planning:** Functions of a personnel manager, Need of Unit Menu, type of operations, Type of service, Job description and job specification
- **Manpower placement:** Recruitment: Process and Sources-Internal and External
  - a) Selection: Process interview, Tests
  - b) Orientation: Importance, Content of programme, Developing an Orientation programme
  - c) Training: Importance; Types - OJT, Group; continuous training, training for development , Developing a training programme
  - d) Contract negotiation with employee : appointment letter, establishment of wages, components of wages , rules and regulations, duties, and service and benefits , contact with vendors
  - e) Performance appraisal: Importance, Methods, Limitations
  - f) Leadership: Importance; Styles, traits and skills
  - g) Motivation: Role; Motivation theories and their application-Content theories: Maslow, Herzberg, McClelland; Process theories: Vroom, Equity; Reinforcement theory; Motivational plan and incentives
  - h) Dealing with organizational behaviour: Absenteeism, Labour turnover, conflict
  - i) Trade unions and collective bargaining, Labor Laws and policies

## RECOMMENDED READINGS

- West B Bessie & Wood Levelle (1988) Food Service in Institutions 6<sup>th</sup> 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
- Tripati P C & Reddy PW ( 2008 ) Principles of Management 3<sup>rd</sup> edition Tata Mc Graw Hill Book Company
- Knight J B & Kotschevar LH (2000) Quantity Food Production Planning & Management 3<sup>rd</sup> edition John Wiley & Sons
- Dessler Gary ( 2007) Human Resource Management 11<sup>th</sup> edition Prentice Hall New Jersey
- Luthans Fred (2004) Organisational Behaviour 10<sup>th</sup> Edition Mc Graw Hill International

## PRACTICAL

Paper No	:	1314 a, b, c
Maximum Marks	:	100
Practical	:	3 Practicals/week (3 periods/practical)
Practical load	:	36 practicals / semester

### a. THERAPEUTIC NUTRITION

#### OBJECTIVES

To enable students to

- **Plan and prepare suitable therapeutic diets based on patient needs for various diseases/disorders**
- **Provide dietary counseling for prevention / treatment of various diseases / disorders**
- **Prepare special therapeutic / health foods**

#### CONTENTS

#### PERIODS

Unit I	Assessment of patient needs – Nutritional assessment & screening	1
Unit II	Planning & preparation of diets for specific disorders	7
Unit III	Market survey of dietetic food s	1
Unit IV	Dietetic food product development	2
Unit V	Diet Counseling	1

## **b. PUBLIC NUTRITION**

### **OBJECTIVES**

- To plan and prepare low cost nutritious dishes / menus for vulnerable groups.
- To develop skills in preparation of communication aids and planning nutrition education programme for the community.
- To be familiar with the ongoing national nutrition programmes.

### **CONTENTS**

### **PRACTICALS**

1. Development of a plan for nutrition education programmes in community.  
Preparation of communication aids for different groups. **4**
2. Development of low cost recipes for infants, preschoolers, elementary school children, adolescents, pregnant and lactating mothers **4**
3. Planning and preparation of diet/ dishes for PEM, VAD and IDA **2**
4. Field visits to ongoing national nutrition programmes **2**

## **c. INSTITUTIONAL FOOD MANAGEMENT**

### **OBJECTIVES**

- To understand the operations of food service units
- To be knowledgeable about products and their price in market
- To develop skills to plan menus for various food service organizations within specific budgets
- To standardized recipes for quantity cooking

### **CONTENTS**

### **PRACTICALS**

#### **UNIT I: MARKET SURVEY**

**2**

- To assess products and commodities in the market
- To formulate price list
- To list and categorize food production and service equipments

**UNIT II. PLANNING MENUS (for any 3)**

**4**

- Institutions that cater to children
- Food service units in Hostels
- Canteen
- Conferences

**UNIT III. STANDARDIZING RECIPES** for 6, 25 and 50 portions.

**4**

Any two of the following

- Snacks
- Cakes
- cereal preparation
- Curry preparations

**Unit IV      CANTEEN PROJECT**

**2**

## **Semester III – SPECIALISATION B**

### **PUBLIC HEALTH NUTRITION**

<b>Paper No.</b>	<b>:</b>	<b>1312 (b)</b>
<b>Maximum Marks</b>	<b>:</b>	<b>100</b>
<b>Teaching Periods</b>	<b>:</b>	<b>4 Periods/week</b>
<b>Teaching Load</b>	<b>:</b>	<b>48 classes</b>

#### **OBJECTIVES**

- To understand the concept of public health nutrition.
- To be familiar with the national health care delivery system.
- To learn about the current concerns in public health nutrition.
- To understand the demographic transition and its implications on the quality of life.
- To understand the economic consequences of malnutrition.
- To learn about the strategies for improving the nutritional status of communities.

#### **CONTENTS**

#### **PERIODS**

##### **UNIT I.**

##### **PUBLIC HEALTH NUTRITION AND HEALTH CARE SYSTEM 18**

- 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

##### **UNIT II: POPULATION DYNAMICS 8**

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

##### **Unit III Health Economics and Economics of Malnutrition – impact on productivity and national development 6**

##### **Unit IV Approaches/ Strategies for Improving nutrition status and health status of the community 16**

- Health based interventions including immunization, provision of safe drinking water/ sanitation, prevention and management of diarrhoeal diseases

- 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 behavior change communication

### **RECOMMENDED READINGS**

- Achaya, K.T. (Ed) (1984) *Interface Between Agriculture, Nutrition and Food Science*,
- 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. (2009) *Park's Textbook of Preventive and Social Medicine, 20<sup>th</sup> ed.* Jabalpur M/s. Banarsidas Bhanot.



## **PROGRAMME PLANNING IN PUBLIC HEALTH NUTRITION**

<b>Paper No.</b>	:	<b>1313 (b)</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Teaching Periods</b>	:	<b>4 Periods/week</b>
<b>Teaching Load</b>	:	<b>48 classes</b>

### **OBJECTIVES**

- To understand the process of planning, implementation and evaluation of public health nutrition programmes.
- To understand the concept of nutrition monitoring and nutrition surveillance.
- To understand the nutritional problems during emergencies / disasters as well as the strategies to tackle them.

### **CONTENTS**

### **PERIODS**

#### **UNIT I PROGRAMME PLANNING AND MANAGEMENT IN PUBLIC HEALTH NUTRITION 10**

- Basic principles and models of programme planning
- Planning process in public nutrition

#### **UNIT II PROGRAMME MONITORING AND EVALUATION 14**

- Definition, significance and purpose of monitoring the food and nutrition programmes
- Identification and selection of indicators for monitoring, data collection and analysis system (e.g. MIS)
- Definition, significance and purpose of evaluation in food and 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 NUTRITIONAL SURVEILLANCE 10**

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

#### **UNIT IV: NUTRITION IN EMERGENCIES AND DISASTERS 14**

- Natural and manmade disasters resulting in emergency situations
- Nutritional problems in emergencies in vulnerable groups
  - Macro and micronutrient deficiencies
  - Infection
- Assessment and surveillance of affected population groups – clinical, anthropometric and dietary

- Nutritional relief and rehabilitation – assessment of food needs, food distribution strategy, mass and supplementary feeding, sanitation and hygiene, evaluation of feeding programmes
- Public nutrition approach to tackle nutritional problems in emergencies

## RECOMMENDED READINGS

- Edelstein S. (2006) Nutrition in Public Health. A handbook for developing programmes and services. Second Edition. Jones and Bartlett Publishers.
- Goyet, Fish. V. Seaman, J. and Geijer, U. (1978) The Management of Nutritional Emergencies in Large Populations, World Health Organization, Geneva.
- FAO. (1983) Selecting Interventions for Nutrition Improvement. A Manual Nutrition in Agriculture. No. 3.
- Gibney M.J., Margetts, B.M., Kearney, J. M. Arab, I., (Eds) (2004) *Public Health Nutrition*, NS Blackwell Publishing.
- Klein, R. E. (Ed) (1979) Evaluating the Impact of Nutrition and Health Programmes. London and New York: Plenum Press.
- Owen. A. Y. and Frankle, R. T. (1986) Nutrition in the Community. The Art of Delivering Services, 2<sup>nd</sup> ed. Times Mirror/ Mosby.
- WFP/ UNHCR (1998) WEP/ UNHCR Guidelines for Selective Feeding Programmes in Emergency Situations. Rome and Geneva: WEP & UNHCR.

## **PRACTICAL**

Paper No	:	1314 (b)
Maximum Marks	:	100
Practical	:	3 Practicals/week (3 periods/practical)
Practical load	:	36 practicals / semester

### **a.THERAPEUTIC NUTRITION**

#### **OBJECTIVES**

To enable students to

- **Plan and prepare suitable therapeutic diets based on patient needs for various diseases/disorders**
- **Provide dietary counseling for prevention / treatment of various diseases / disorders**
- **Prepare special therapeutic / health foods**

<b>CONTENTS</b>	<b>PERIODS</b>
Unit I Assessment of patient needs – Nutritional assessment & screening	1
Unit II Planning & preparation of diets for specific disorders	7
Unit III Market survey of dietetic food products	1
Unit IV Dietetic food product development	2
Unit V Diet Counseling of patients/ caretakers of family members	1

#### **RECOMMENDED READINGS**

- Mahan, L. K. and Escott Stump. S. (2008) *Krause's Food & Nutrition Therapy 12<sup>th</sup> ed.* Saunders-Elsevier
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease. 10<sup>th</sup> ed.* Lipincott, William and Wilkins.
- Gibney MJ, Elia M, Ljungqvist &Dowsett J. (2005) *Clinical Nutrition.* The Nutrition Society Textbook Series. Blackwell Publishing Company
- Williams, S.R. (2001) *Basic Nutrition and Diet Therapy. 11<sup>th</sup> ed.* Times Mirror Mosby College Publishing

- Dorland WA Newman. (2003) *Dorland's Illustrated Medical Dictionary*. 30<sup>th</sup> ed. WB Saunders Co.
- ICMR (2003) Dietary Guidelines for Indians – A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
- ICMR (1999) Nutritive value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.

## **b. PUBLIC HEALTH NUTRITION**

### **OBJECTIVES**

- To plan and prepare low cost nutritious dishes and menus for vulnerable groups.
- To develop skills in analysing of nutritional assessment data.
- To become aware of the field level functioning of the ongoing national public health nutrition programmes.

### **CONTENTS**

### **PRACTICALS**

#### **UNIT I**

**6**

Development of nutritious food supplements/ dishes (suitable at micro/macro level) for various vulnerable segments of population

#### **UNIT II**

**4**

Assessment of the type of nutritional problems and their determinants in different population groups through analysis of secondary data (such as NSSO, NFHS data etc)

#### **UNIT III**

**2**

Field visits to ongoing public health nutrition programmes.

## **c. PROGRAMME PLANNING IN PUBLIC HEALTH NUTRITION**

### **OBJECTIVES**

- **To assess the health and nutrition needs of the community.**
- **To design an action plan for addressing a public health nutrition problem in the community.**

### **CONTENTS**

### **PRACTICALS**

#### **UNIT I**

**4**

Assessment of their needs and study the public health nutrition problems in an identified community.

#### **UNIT II**

**8**

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

### ***RECOMMENDED READINGS***

- Edelstein S. (2006) *Nutrition in Public Health: A handbook for developing programmes and services*. Second Edition. Jones and Bartlett Publishers.
- Goyet, Fish. V. Seaman, J. and Geijer, U. (1978) *The Management of Nutritional Emergencies in Large Populations*, World Health Organization, Geneva.
- 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.
- Klein, R. E. (Ed.) (1979) *Evaluating the Impact of Nutrition and Health Programmes*. London and New York: Plenum Press.
- Owen, A.Y. and Frankle, R. T. (1986) *Nutrition in the Community, The Art of Delivering Services, 2<sup>nd</sup> ed.* Times Mirror/Mosby.
- WFP / UNHCR (1998) *WEP / UNHCR Guidelines for Selective Feeding Programmes in Emergency Situations*. Rome and Geneva: WEP & UNHCR.

**SEMESTER III (SPECIALISATION C)**  
**FOOD PROCESSING - I**

Paper No.	:	1311
Maximum Marks	:	100
Teaching Periods	:	4 /week
Teaching Load	:	48 periods/ Semester

**OBJECTIVES**

- To impart systematic knowledge of basic and applied aspects in food processing and technology
- To enable the student to understand food composition and its physico chemical, nutritional and sensory aspects.
- To gain in depth knowledge about processing and preservation techniques of cereal and cereal products and meat and meat products.
- To optimise process parameter for consistent quality processed food products.

**CONTENTS**

**PERIODS**

**UNIT I: Cereal and cereal products technology**

**32**

1. **Cereals:** Wheat, rice, maize, barely, oat, rye- Structure, cultivation, harvesting, properties, composition and commercial value.
2. **Milling process:** Complete milling process, break rolls, reduction rolls, milled products and their nutritive value and applications.
3. **Baking technology:** Bread, biscuits/ Cookies and cake, Principles of baking, Ingredients and their functions, methods of preparation, in-process control, faults, causes and remedies, methods of leavening: physical, biological and chemical, scoring of quality parameters.

**UNIT II: Meat, fish, poultry, egg and its products technology**

**16**

- 1 **Meat:** Composition, variety, slaughtering and related practices, pre-slaughter handling, grading, ageing, curing, smoking and tenderizing of meat, meat pigments and colour changes, cooking, storage, methods of preservation for value addition and spoilage.
- 2 **Poultry:** Production considerations, Processing plant operations (slaughter and bleeding, scalding, defeathering, eviscerating, chilling and packaging), cooking, tenderness, flavour and colour changes.
- 3 **Eggs:** Composition, quality factors, storage, bacterial infection and pasteurization, freezing, drying and egg substitutes.
- 4 **Fish:** Composition, onboard handling & preservation, drying and dehydration, salt curing, smoking, marinades, fermented products, canning, Modified Atmosphere Packaging, and quality factors.

## **RECOMMENDED READINGS**

- Fabriani, G and Lintas C. (1988) Durum Wheat Chemistry and Technology. American Association of Cereal Chemistry Inc.
- Kent N L.(1993) Technology of Cereals. 4<sup>th</sup> 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.
- Matz A Samuel, Bakery Technology and Engineering.
- Pomeranz Yeshuraj, Food Analysis: Theory and Practice.

## ADVANCED FOOD SCIENCE -I (Theory)

Paper No.	:	1313 (c)
Maximum Marks	:	100
Teaching Period	:	4 periods/ week
Teaching Load	:	48 periods

### OBJECTIVES

- To understand concepts of unit operations in processing .
- To understand principles of food preservation and its application.
- To understand nature of various food products constituents, additives and adulterants.

### CONTENTS

### PERIODS

#### UNIT – I: UNIT OPERATIONS

10

1. **Raw material preparation-** Cleaning, sorting, grading and peeling
2. **Size reduction-** Size reduction of solid foods, size reduction in liquid foods (Emulsification and homogenization) theory and equipment
3. **Separation and concentration of food components-** Centrifugation, Filtration, Expression, Extraction using solvent, membrane concentration (Hyper filtration and ultra filtration),theory equipments and effects on foods.

#### UNIT- II: MIXING AND FORMING

10

Mechanical separation, texture, colour, flavour

#### UNIT – III: Application of heat: Theory, processing, equipment, effect on food texture, colour, flavour and nutritional value.

20

1. **Heat processing using steam or water**  
**Pasteurization:** theory equipment (Pasteurization of packaged foods and Unpackaged food products), effect on food, colour flavour, aroma and vitamins **Heat sterilization:** In-containers sterilization, theory, retorting and equipments, Ultra high temperature/ aseptic processes: Theory, processing, equipments, effects on food – colour, flavour and aroma, texture and viscosity nutritive value  
**Evaporation and distillation:** evaporation, effect on food, distillation
2. **Extrusion:** theory: rheological properties of foods, operating characteristics, equipments- Single screw extruder, twin screw extruder, ancillary, equipments, application, cold extrusion – cooking, effects on food, sensory characteristics and nutritional value
3. **Heat processing by hot air:** dehydration- theory: brine using heated air and heated surfaces, equipments: Hot air driers, heated surface (or contact driers), effects on foods (texture, flavour and aroma, colour nutritional value).
4. **Baking:** theory, equipments, direct heat, indirect heating and batch ovens,



continuous and semi continuous ovens, effect on food texture, flavour aroma and colour and nutritional value.

**UNIT – III: HEAT PROCESSING USING HOT OIL**

**4**

**Frying:** theory, shallow frying and deep fat frying, equipments, effect on foods, effect of heat on oil and effect of heat on fried foods.

**UNIT – IV: FOOD COLOURS AND ADDITIVES**

**4**

**RECOMMENDED READINGS**

- Fellows P J (2002), Food Processing Technology- Principles and Practices, 2<sup>nd</sup> Edition. Woodhead Publishing Ltd
- Harper J C, (1975) Elements of Food Engineering. A VI, West port.
- Fennema O R, (1985), Principles of Food Science: Part- II Physical Principles of Food Preservation. Marcel Decker New York
- Peter S. Murano (2003), Understanding Food Science and Technology. Peter Marshall Publisher.
- Winton & Winton, (1991) Techniques of Food Analysis. Allied Scientific Publishers.
- Rahman M S, (2007) Handbook of Food Preservation 2<sup>nd</sup> Edition by Taylor & Francis Group, CRC Press

## **PRACTICAL**

Paper No	:	1314 (b)
Maximum Marks	:	100
Practical	:	3 Practicals/week (3 periods/practical)
Practical load	:	36 practicals / semester

### **a.THERAPEUTIC NUTRITION**

#### **OBJECTIVES**

To enable students to

- **Plan and prepare suitable therapeutic diets based on patient needs for various diseases/disorders**
- **Provide dietary counseling for prevention / treatment of various diseases / disorders**
- **Prepare special therapeutic / health foods**

#### **CONTENTS**

#### **PERIODS**

Unit I	Assessment of patient needs – Nutritional assessment & screening	1
Unit II	Planning & preparation of diets for specific disorders	7
Unit III	Market survey of dietetic food s	1
Unit IV	Dietetic food product development	2
Unit V	Diet Counseling	1

#### **RECOMMENDED READINGS**

- Mahan, L. K. and Escott Stump. S. (2008) *Krause's Food & Nutrition Therapy 12<sup>th</sup> ed.* Saunders-Elsevier
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease. 10<sup>th</sup> ed.* Lipincott, William and Wilkins.
- Gibney MJ, Elia M, Ljungqvist &Dowsett J. (2005) *Clinical Nutrition.* The Nutrition Society Textbook Series. Blackwell Publishing Company
- Williams, S.R. (2001) *Basic Nutrition and Diet Therapy. 11<sup>th</sup> ed.* Times Mirror Mosby College Publishing

- Dorland WA Newman. (2003) *Dorland's Illustrated Medical Dictionary*. 30<sup>th</sup> ed. WB Saunders Co.
- ICMR (2003) Dietary Guidelines for Indians – A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
- ICMR (1999) Nutritive value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.

## **B. FOOD PROCESSING - I**

### **OBJECTIVES**

- To understand the raw material analysis and their processing technology used in different product development.
- To understand the processing technologies of different products and concept of product optimization.

### **CONTENTS**

### **PERIODS**

#### **Unit I: CEREAL AND CEREAL PRODUCTS TECHNOLOGY**

- |  |          |
|--|----------|
| <b>1. Bread baking:</b>  | <b>3</b> |
| <ul style="list-style-type: none"> <li>• <b>Quality testing of different flour:</b> Gluten quality and quantity, moisture and ash percent, Water Absorption Power (WAP), Pekar color test, Maltose value, Falling Number, Dough Raising Capacity.</li> </ul>   |          |
| <ul style="list-style-type: none"> <li>• <b>Bread Processing:</b> Straight dough method , sponge &amp; dough method (delayed salt method) and potassium bromate response of different flours, optimisation of brown bread process, preparation of sweet buns/pizza base and process optimisation.</li> </ul> | <b>4</b> |
| <b>2. Biscuit and cake:</b>  | <b>4</b> |
| <ul style="list-style-type: none"> <li>• Short and hard dough biscuits, packaging and shelf life studies.</li> <li>• Sponge and cream cakes, packaging and shelf life studies.</li> </ul>  |          |

#### **Unit II: MEAT AND MEAT PRODUCTS TECHNOLOGY**

- |                                    |          |
|------------------------------------|----------|
| Visit to meat processing industry. | <b>1</b> |
|------------------------------------|----------|

## RECOMMENDED READINGS

- Fabriani, G and Lintas C. (1988) Durum Wheat Chemistry and Technology. American Association of Cereal Chemistry Inc.
- Kent N L.(1993) Technology of Cereals. 4<sup>th</sup> 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.
- Matz A Samuel, Bakery Technology and Engineering.
- Pomeranz Yeshuraj, Food Analysis: Theory and Practice.

## c. ADVANCED FOOD SCIENCE I

### OBJECTIVES

1. To apply knowledge in application various physical and chemical parameters of raw and processed food products.
2. To learn analysis of various food products constituents, additives and adulterants.

### CONTENTS

### PERIODS

#### Unit I: Unit Operations

1

1. Methods of grading and cleaning of raw materials (grains, spices, fruits and vegetables).

2. Visit to milk and milk products processing industries for exposure of students to measurement of pressure, flow of fluids, heat exchangers and dryers, elevating and conveying equipments, size reduction equipment, sieve analysis, food plant design, and mechanical separators

1

#### UNIT – II: Application of heat

1

1. Estimation of tannins in relation to astringency.

2. Texture analysis of foods by texturometer.

1

3. Determination and estimation of food additives: nitrites, boric acid, sorbic acid, sulphur dioxide, MSG, sodium chloride, natural and artificial food

- |   |            |
|---|------------|
| colors.   | <b>2</b>   |
| 4. Determination and estimation of adulterants in foods: honey, fats & oils, spices (turmeric and red chilly powder). | <b>1</b>   |
| 5. Estimation of trypsin inhibitor in foods.  | <b>1</b>   |
| 6. Carotenoid estimation in fruits and vegetables.  | <b>1</b>   |
| 7. Determination of carbon dioxide pressure in carbonated beverages.  | <b>1/2</b> |
| 8. Effect of heat on Chlorophylls and its estimation in foods by spectrophotometer.                                   | <b>1</b>   |
| 9. Preparation of brix solution and checking by Abbey's refractometer.  | <b>1/2</b> |

**UNIT- III: Mixing and forming** **1**

- Visit to bread and biscuit industry to observe mixing and forming operations and their equipment.

**RECOMMENDED READINGS**

- Fellows P J (2002), Food Processing Technology- Principles and Practices, 2<sup>nd</sup> Edition. Woodhead Publishing Ltd
- Harper J C, (1975) Elements of Food Engineering. A VI, West port.
- Fennema O R, (1985), Principles of Food Science: Part- II Physical Principles of Food Preservation. Marcel Decker New York
- Peter S. Murano (2003), Understanding Food Science and Technology. Peter Marshall Publisher.
- Winton & Winton, (1991) Techniques of Food Analysis. Allied Scientific Publishers.
- Rahman M S, (2007) Handbook of Food Preservation 2<sup>nd</sup> Edition by Taylor & Francis Group, CRC Press

## **INTERNSHIP**

<b>Paper No.</b>	:	<b>1315 (a)</b>
<b>Maximum Marks</b>	:	<b>50</b>
<b>Teaching Period</b>	:	<b>2 periods/ week</b>
<b>Teaching Load</b>	:	<b>24 per semester</b>

### **OBJECTIVE**

- 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 a report of their Internship in their Department.

## **DISSERTATION**

<b>Paper No.</b>	:	<b>1315 (b)</b>
<b>Maximum Marks</b>	:	<b>150 (both for III and IV semester)</b>
<b>Teaching Period</b>	:	<b>4 periods/ week</b>
<b>Teaching Load</b>	:	<b>48 per semester</b>

### **OBJECTIVE**

- **To initiate research work in Semester III and submit the dissertation at the end of Semester IV.**

The students will be guided and supervised by a member of the teaching faculty of the concerned department. The dissertation in which the research culminates should reflect the student's own work.

## **SEMESTER IV – SPECIALISATION A**

### **ADVANCED CLINICAL NUTRITION (Theory)**

Paper No.	:	1411 (a)
Maximum Marks	:	100
Teaching Periods	:	4 /week
Teaching Load	:	48 periods per Semester

#### **OBJECTIVES**

- To understand the etiology, physiological and metabolic anomalies of acute and chronic disorders / diseases
- To understand the effect of various disorders / diseases on nutritional status, nutritional and dietary requirements
- To be able to recommend and provide appropriate nutrition care for prevention and treatment of various disorders / diseases
- To remain updated on recent advances in Medical Nutrition Therapy (MNT) for various diseases

#### **CONTENTS**

#### **PERIODS**

##### **UNIT I NUTRITION CARE**

**5**

- Diet, Nutrient and Drug interactions
- Nutrition Support – Parenteral Nutrition

##### **UNIT II METABOLIC STRESS & CANCER**

**11**

Metabolic & clinical aberrations, diagnosis, complications, treatment, MNT and dietary counselling in

- Metabolic Stress -Surgery, Burns, Sepsis & Trauma
- Critical care
- Cancer- General & Specific cancers, Effect of Cancer therapy on MNT



### **UNIT III Gastrointestinal Tract Disorders :**

**14**

Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications and recent advances in prevention, treatment, MNT and dietary counseling in

- GI Tract Disorders -  
Diverticular Diseases,  
IBD: Crohn's Disease & Ulcerative Colitis
- Liver, Gallbladder and Pancreatic Disorders –  
Cirrhosis, Encephalopathy, Liver Transplant; Cholecystitis,  
Cholecystectomy; Pancreatitis.

### **Unit IV Diseases of Heart and Blood Vessels :**

**6**

Etiopathophysiology, metabolic & clinical aberrations, diagnosis, complications and recent advances in prevention, treatment, MNT and dietary counselling in

- Myocardial Infarction
- Congestive Heart failure
- Coronary Bypass Surgery

### **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
- Dialysis, Transplant
- Renal Stones.

### **RECOMMENDED READINGS**

- Mahan, L. K. and Escott Stump. S. (2008) *Krause's Food & Nutrition Therapy 12<sup>th</sup> ed.* Saunders-Elsevier
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease. 10<sup>th</sup> ed.* 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. 10<sup>th</sup> ed.* Churchill Livingstone.

- Marian M, Russel M, Shikora SA. (2008) Clinical Nutrition for Surgical Patients. Jones and Bartlett Publishers.

## **CHALLENGES IN CLINICAL NUTRITION**

<b>Paper No.</b>	:	<b>1412 (a)</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Teaching Periods</b>	:	<b>4 /week</b>
<b>Teaching Load</b>	:	<b>48 periods per Semester</b>

### **OBJECTIVES**

- To develop understanding of concepts & contents of nutrition communication and communication methods for behavior change
- To understand common nutritional & dietary concerns /problems and nutritional requirements of special groups
- To be able to recommend and provide appropriate nutrition care for these groups
- To remain updated on recent advances in nutrition care, preventive and/or therapeutic aspects of these areas

### **CONTENTS**

### **PERIODS**

#### **UNIT I Dietary Counselling & Communication for Behaviour Change 11**

- Meaning & objectives
- Basics of communication, interviewing & counseling skills for behaviour change
- Assessing & monitoring dietary behaviour
- Designing instructional plans
- Computer assisted nutrition counseling –individual & group

#### **UNIT II Pediatric Nutrition**

**15**

- Nutritional assessment of children
- Management of severe acute malnutrition in children
- Feeding problems of children with special health care needs – cleft palate, craniofacial anomalies, neurodevelopmental disorders
- IBEM- PKU, MSUD, galactosemia, tyrosinemia
- Cystic fibrosis
- Congenital heart disease

### **UNIT III NUTRITION FOR PHYSICAL FITNESS & SPORTS PERFORMANCE 10**

- Management of Fitness & Health
- Physiological Aspects – Metabolic changes during sports activity
- Effect of Specific Nutrients on Work Performance & Physical Fitness.
- Energy Systems for Endurance & Power Activity
- Fuels for Muscle Contraction
- Nutritional Requirements for Sports: Pre During and Post Game (Short Duration, Endurance)
- Water and Electrolyte Balance Management
- Other Dietary Considerations
- Ergogenic Aids, Use & Abuse of Dietary Supplements

### **UNIT IV OVERVIEW OF**

**12**

- Lung disorders – Bronchopulmonary dysplasia, COPD
- Musculoskeletal & Rheumatic Disorders –Osteoporosis, Arthritis, SLE, Multiple Sclerosis
- Nutrigenomics – the future of Nutrition Care for Health Management, Treatment & Prevention of Diseases
- Complementary & Adjunctive Therapies – naturopathy, Ayurveda , Phytotherapy,

### **RECOMMENDED READINGS**

- Curry KA & Jaffe A (1998) Nutrition Counseling Skills & Communication Skills. WB Saunders & Co.
- Snetselaar LG (2009) Nutrition Counseling Skills for the Nutrition Care Process. James & Bartlett Pub.
- Hickson JH (2000) Nutrition for Exercise & Sport. CRC Press. 2<sup>nd</sup> Edition
  - Mahan, L. K. and Escott Stump. S. (2008) *Krause's Food & Nutrition Therapy 12<sup>th</sup> ed.* Saunders-Elsevier
  - Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) *Modern Nutrition in Health and Disease. 10<sup>th</sup> ed.* Lipincott, William and Wilkins.
  - Gibney MJ, Elia M, Ljungqvist & Dowsett J. (2005) *Clinical Nutrition.* The Nutrition Society Textbook Series. Blackwell Publishing Company

## **ENTREPRENEURSHIP IN FOOD SERVICE**

<b>Paper No.</b>	<b>:</b>	<b>1413 (a)</b>
<b>Maximum Marks</b>	<b>:</b>	<b>100</b>
<b>Teaching Periods</b>	<b>:</b>	<b>4 Periods/week</b>
<b>Teaching Load</b>	<b>:</b>	<b>48 classes</b>

### **OBJECTIVES**

- **To develop a knowledge base about the physical facilities needed for different types of food service units**
- **To impart necessary expertise to manage the financial aspects in the units**
- **To provide practical experience in maintenance of sanitation and safety in units**
- **To help develop marketing strategies**
- **To equip individuals to start their own food service unit as entrepreneurs**

### **UNIT I Space and Equipment**

**8**

#### **a) Layout planning :**

- Preliminary preparation-Information gathering , Menu analysis , Determining type of service
- Determining: basic units and equipment
- Steps in planning: Prospectus, planning team
- Design development.- Types of kitchen areas , Flow of work and work area relationship

#### **b) Determining equipment needs**

- Types of Equipments
- Features of equipments
- Factors affecting selection of equipments
- Equipment needs for different situations

#### **c) Architectural considerations for a Food Service Establishment**

#### **d) Feasibility assessment in terms of layout design and costs**

## **UNIT II Financial Management**

**12**

- a) Importance of Financial Management in a food based enterprise
- b) Budgets and Budgeting process,
- c) Records: Menu, Purchase, Store, Production, Sales, Personnel, Utilities
- d) Basic concepts in business transactions: Cash memo, Receipt, Pay-in-slip, Cheques Vouchers
- e) Books of Account: Journal, Sales Return Book, Purchases Return Book, Sales Book, Purchase Book, Cash Book, Ledger
- f) Pricing and its methods, Costing, concepts and controlling techniques; cost effective procedures, Concept of Break Even Point (BEP)
- g) Reports :Cost analysis: Concept of Trial Balance, Profit and Loss Account

## **UNIT III Marketing and Sales Strategies**

**4**

- a) Product Differentiation
- b) Marketing techniques and strategies
- c) Sales management

## **UNIT IV Food Hygiene Sanitation and Safety**

**7**

- a) Importance of hygiene and sanitation in food service units
- b) Sanitation measures for Food , Personnel and UnitHygiene, Training techniques for food service personnel in Sanitation.
- c) Safety- causes of accidents , types, safety techniques, 3 Es of Safety
  
- d) Food laws/Food bill- FPO, ISI, AGMARK, PFA, New Food Bill 2006
- e) Quality standards-HACCP, ISO

## **UNIT V Establishment and Operations of a Food Based Enterprise**

### **Conceptualizing the Enterprise:**

**14**

- Survey of types of units, consumer needs , identifying clientele, menu, operations and delivery

### **Planning the set up:**

- a) Identifying resources
  - Facility available and equipments needed
  - Menu and precosting
  - Manpower required
  - Utilities
- b) Developing Project plan and Determining investments
- c) Feasibility assessment

**Operationalising the unit**

Procedures for menu planning, purchase, production and delivery of product

**Evaluation of the working of unit**

- Food cost analysis
- Sales analysis
- Profit and loss statement
- Balance sheet

**VI. Project Proposal****3**

Plan a project proposal /Business plan for setting up a food based enterprise

**RECOMMENDED READINGS**

- West B Bessie & Wood Levelle (1988) Food Service in Institutions 6<sup>th</sup> 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 3<sup>rd</sup> Edition Von Nostrand Reinhold New York
- Kotas Richard & Jayawardardene. C (1994) Profitble Food and Beverage Management Hodder & Stoughton Publications
- Kotler Philip Marketing management (2001) Millennium Edition Prentice Hall of India
- Taneja S and Gupta SL ( 2001) Entrepreneurship development, Galgotia Publishing

## **PRACTICAL**

Paper No	:	1414 a, b, c
Maximum Marks	:	100
Practical	:	3 Practicals/week (3 periods/practical)
Practical load	:	36 practicals/ semester

### **a. ADVANCED CLINICAL NUTRITION - I**

#### **OBJECTIVES**

To enable students to:

- **Develop skill in nutritional diagnosis, planning and providing suitable preventive/ therapeutic diets for various diseases / disorders**
- **Provide effective dietary counseling for these disorders**
- **Be aware of various commercial nutritional therapeutic products available in India**

#### **CONTENTS**

#### **PERIODS**

<b>UNIT I</b> Market Survey for commercial nutritional therapeutic products	<b>1</b>
<b>UNIT II</b> Planning & preparation of diets for disorders covered in theory with introduction to mixed / multiple disorders and complications , using case study approach	<b>8</b>
<b>UNIT III</b> Diet counseling for disorders covered in theory & development of diet counseling aids. Use of computers for the same.	<b>3</b>

## **b. CHALLENGES IN CLINICAL NUTRITION**

### **OBJECTIVES**

To enable students to:

- Develop skills in interviewing & dietary counseling, individualized & group , for various disorders studied
- Design & develop effective diet counseling & self care material (Project)
- Gain competency in planning & preparation of diets for pediatric disorders
- Critically evaluate commercial nutritional products for physical fitness & sports performance available in India

### **CONTENTS**

### **PERIODS**

<b>UNIT I:</b> Market Survey for commercial nutritional products for physical fitness & sports performance available in India – critical evaluation	<b>2</b>
<b>UNIT II:</b> Planning & preparation of diets for pediatric disorders	<b>4</b>
<b>UNIT III:</b> Diet counseling for various disorders using diet counseling aids developed for the same and evaluating the efficacy of the counseling aids.	<b>6</b>



## **c. ENTREPENURSHIP IN FOOD SERVICE MANAGEMENT**

### **OBJECTIVES**

- To understand the practical operations of some food service units.
- To gain knowledge about handling operations in different catering units
- To gain skills to develop suitable products for different situations.
- To gain knowledge about some regional and international cuisines
- To understand the procedures involved in training and sales promotion.

### **CONTENTS**

### **PERIODS**

<b>Unit I Case study of two food service units</b>	<b>2</b>
<b>Unit II Catering management (any 2 situations)</b> <ul style="list-style-type: none"><li>• Conference / Workshop</li><li>• Food stall</li></ul>	<b>3</b>
<b>Unit III Product development</b> <ul style="list-style-type: none"><li>• Healthy food</li><li>• Party food</li></ul>	<b>3</b>
<b>Unit IV Regional / International cuisine</b>	<b>2</b>
<b>Unit V Development / training</b> <ul style="list-style-type: none"><li>• Development of sales promotion tools</li><li>• Training food service personnel in sanitation</li></ul>	<b>2</b>

## **SEMESTER IV, SPECIALIZATION B**

### **PUBLIC HEALTH ASPECTS OF MALNUTRITION**

<b>Paper No.</b>	<b>:</b>	<b>1411 (b)</b>
<b>Maximum Marks</b>	<b>:</b>	<b>100</b>
<b>Teaching Periods</b>	<b>:</b>	<b>4 Periods/week</b>
<b>Teaching Load</b>	<b>:</b>	<b>48 classes</b>

#### **OBJECTIVES**

- To understand the principles of nutritional epidemiology and its importance in public health
- To understand the prevalence and determinants of community's nutritional/ health problems.
- To learn about the public health implications of various nutritional problems and the strategies to overcome the same.

#### **CONTENTS**

#### **PERIODS**

#### **Unit I Epidemiology 14**

- Definition, aims, basic measurements and applications
- Study designs – methods applied in conducting nutrition research
- Measuring exposure (diet) outcome (disease) relationship and their interpretation

#### **Unit II Public Health Aspects of Under Nutrition 24**

Etiology, public health implications, prevention and community based management of PEM, sever acute malnutrition and micronutrient deficiencies of public health significance.

#### **Unit III Public Health Aspects of life style related disorders 10**

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

## RECOMMENDED READINGS

- Berg, A. (1973) *The Nutrition Factor*, The Brookings Institution, Washington.
- Bonita R, Beaglehole R, Kjellstrom ( 2006) *Basic Epidemiology*. Second Edition. WHO.
- Frank G.C. (2008) *Community Nutrition-Applying epidemiology to contemporary practice*. Second Edition. Jones and Bartlett Publishers.
- 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.
- Park, K. (2009) *Park's Textbook of Preventive and Social Medicine*, 20<sup>th</sup> ed. Jabalpur M/s. Banarsidas

# **PROGRAMMES AND POLICIES FOR FOOD AND NUTRITION SECURITY**

<b>Paper No.</b>	:	<b>1412 (b)</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Teaching Periods</b>	:	<b>4 Periods/week</b>
<b>Teaching Load</b>	:	<b>48 classes</b>

## **OBJECTIVES**

- To understand the concept of food and nutrition security.
- To gain knowledge regarding the national / public sector policies and programmes for improving food and nutrition security.
- To become familiar with some successful development programmes in attaining nutrition security.

## **CONTENTS**

## **PERIODS**

### **Unit I Food and Nutrition Security**

**10**

- 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.

### **Unit II National / Public Sector Policies for Improving Food and Nutrition Security**

**10**

- Role of national public policies in improving food and nutrition security (agriculture, food, nutrition, water and sanitation and health sectors)
- National Plan of Action on Nutrition

### **Unit III Public Sector Programmes for Improving of Food and Nutrition Security** Rationale, implementation status, monitoring / evaluation and critical appraisal of ongoing programmes.

**18**

**RECOMMENDED READINGS**

- Achaya, K.T. (Ed) (1984) *Interface Between Agriculture, Nutrition and Food Science*,
- Gibney M.J., Margetts, B.M., Kearney, J. M. Arab, I., (Eds) (2004) *Public Health Nutrition*, NS Blackwell Publishing.
- Gopalan, C. and Kaur, S. (Eds) (1993) *Towards Better Nutrition, Problems and Policies*, Nutrition Foundation of India.
- Park, K. (2009) *Park's Textbook of Preventive and Social Medicine, 20<sup>th</sup> ed.* Jabalpur M/s. Banarsidas Bhanot.
- National Nutrition Policy, Gol, 1993.
- National Plan of Action on Nutrition, Gol, 1995.

# **NUTRITION COMMUNICATION FOR HEALTH PROMOTION**

<b>Paper No.</b>	:	<b>1413 (b)</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Teaching Periods</b>	:	<b>4 Periods/week</b>
<b>Teaching Load</b>	:	<b>48 classes</b>

## **OBJECTIVES**

- **To be familiar with the national/international dietary guidelines addressing nutrition and health aspects.**
- **To learn about the determinants of food behaviour.**
- **To be able to plan, implement and evaluate behaviour change communication for promotion of nutrition and health among the vulnerable groups.**
- **To understand the concept of nutrition advocacy.**

## **CONTENTS**

## **PERIODS**

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

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

### **Unit II Nutrition and Behaviour Inter-relationship 10**

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

### **Unit III Behaviour Change Communication for nutrition and health promotion 20**

- **Concept and objectives of communication for behaviour change**
- **Planning of communication strategies for behaviour change programme**  
Communication needs analysis, stakeholders in nutrition promotion, developing nutrition education plan, identifying communication strategies and 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 strategy for trainers and building capacity.
- **Implementing behaviour change communication intervention : overview**
- **Evaluation of communication for behaviour change programmes**
- **Ethics in nutrition and health communication**

## **Unit IV Nutrition Advocacy – Role in policy formulation and execution. 8**

Theory of advocacy, Advocacy vs Behaviour Change Communication, analysis of the policy environment, preparation of policy briefs, monitoring and evaluation of policy related activities and outcomes.

### **RECOMMENDED READING**

- 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).
- *Public Health Communication: Evidence for Behavior Change* by Robert C. Hornik © 2002 by Lawrence Erlbaum Associates, Inc.
- *Communication and Health: Systems and Applications*. Edited by Eileen Berlin Ray and Lewis Donohew © 1990 by Lawrence Erlbaum Associates, Inc.
- *Designing health messages: Approaches from Communication Theory and Public Health Practice*. Editors: Edward Maibach and Roxanne Louiselle Parrott © 1995 by Sage Publications, Inc.
- *Community Nutrition in Action: An Entrepreneurial Approach*. Fourth Edition. Marie A. Boyle and David H. Holben. © 2006 Thomson Wadsworth.

## **PRACTICAL**

<b>Paper No</b>	<b>:</b>	<b>1414 a, b, c</b>
<b>Maximum Marks</b>	<b>:</b>	<b>100</b>
<b>Practical</b>	<b>:</b>	<b>3 Practicals/week (3 periods/practical)</b>
<b>Practical load</b>	<b>:</b>	<b>36 practicals / semester</b>

### **a. PUBLIC HEALTH NUTRITION**

#### **OBJECTIVES**

- **To develop skills in preparation of communication strategies and communication aids for nutrition / health promotion of the community.**
- **To plan, implement and evaluate nutrition education programme for the community.**
- **To prepare an evaluation plan for a public health nutrition programme.**
- **To implement and evaluate an action plan for a public health nutrition programme in the community.**

#### **UNIT I**

Planning, implementation and evaluation of a nutrition education programme for the identified community. 3

#### **UNIT II**

Planning an evaluation for a public health/ nutrition programme. 3

#### **UNIT III**

Planning of a communication strategy for a nutrition education programme in the community; field testing of messages, materials and methods. 3

#### **UNIT IV**

Implementation and evaluation of the action plan (developed in Semester III) for a public nutrition programme for the identified community. 3



## SEMESTER IV, SPECIALIZATION C

### FOOD PROCESSING - II (Theory)

Paper No.	:	1313 (c)
Maximum Marks	:	100
Teaching Period	:	4 periods/ week
Teaching Load	:	48 periods

#### OBJECTIVES

- To impart systematic knowledge of basic and applied aspects food processing and technology
- To enable the student to understand food composition and its physico chemical, nutritional and sensory aspects.
- To gain in depth knowledge about processing and preservation techniques of milk and milk product technology and fruits and vegetable technology.
- To gain knowledge about industrial processing of legumes and oil seeds.

#### CONTENTS

#### PERIODS

##### Unit I: Milk and milk products technology

24

- **Milk:** composition, factors affecting milk quality, physical and chemical properties.
- **Milk processing:** Separation, centrifugal process, natural creaming, pasteurization, sterilization, homogenization, effect of processing on nutritive value.
- **Milk products:** Khoa, Chnna, butter, butter oil, margarine, cheese, ice cream- Commercial processing, BIS Standards, packaging and distribution
- **Quality testing:** Platform tests, tests for adulterants, and quality testing of milk products.

##### Unit II: Fruits and vegetable technology

24

- Structure and composition of different fruits and vegetables in relation to processing
- Principles of fruits and vegetables preservation
- Processing technologies: Freezing, dehydration/ during, canning,

- preserves: jam, jelly, marmalade, pickel, sauce, squash, chatni.
- Processing and preservation for small scale industry
  - FPO 1955

### **RECOMMENDED 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 1<sup>st</sup> Edition. A VI publication USA.
- De Su Kumar, Milk and milk products technology.
- National Dairy Development Board, Amul, Milk and milk products processing.

## ADVANCED FOOD SCIENCE - II (Theory)

Paper No.	:	1412 (c)
Maximum Marks	:	100
Teaching Period	:	4 periods/ week
Teaching Load	:	48 periods

### OBJECTIVES

- To understand concepts of various unit operations in processing methods.
- To understand principles of food preservation and its application.
- To understand various post processing operations important from industrial point of view.

### CONTENTS

### PERIODS

#### **UNIT I Low temperature processing/ by removal of heat: Theory, equipments and effects on food** **20**

- 1 **Chilling:** Fresh foods, processed foods and cooked-chill system, mechanical refrigerator and cryogenic chilling, chill storage- storage conditions
- 2 **Controlled and modified atmosphere storage and packaging-** modified and controlled atmospheric storage, MAP for fresh food, MAP for processed food, packaging material for MAP, active packaging system.
- 3 **Freezing:** Ice crystal formation, solute concentration, volume changes, calculation of freezing time, cooled air freezers, cooled liquid freezers, cooled surface freezers, cryogenic freezer, changes in food: effect of freezing, effect of frozen storage, thawing.
- 4 **Freeze drying and freeze concentration:** Freeze drying (Lyophilisation)- Freeze concentration

#### **UNIT II Fermentation**

**10**

Food conversion, Food cultures, lactic acid bacteria and other bacteria, lactic acid bacteria with yeast, lactic acid bacteria with moulds, miscellaneous fermentation.

### **UNIT III Irradiation**

**5**

Theory, equipment, application and effect on food colour, flavour, nutrients and micro organisms, effect on packaging and detection of irradiated foods.

### **UNIT IV Post processing operations**

**13**

- 1 Coating and enrobing
- 2 Packaging: theory, types of packaging material, printing, interaction between packaging and foods, environmental consideration.
- 3 Filing and sealing of containers: rigid and semi rigid containers, flexible containers, types of sealers, shrink wrapping and stretch wrapping, temperature evident packaging, labelling, check weighing, metal detection.
- 4 Material handling, storage and distribution, food plant sanitation. Waste management, disposal, storage and distribution.

### **RECOMMENDED READINGS**

- Fellows P J (2002), Food Processing Technology- Principles and Practices, 2<sup>nd</sup> Edition. Woodhead Publishing Ltd
- Harper J C, (1975) Elements of Food Engineering. A VI, West port.
- Peter S. Murano (2003), Understanding Food Science and Technology. Peter Marshall Publisher.
- Winton & Winton, (1991) Techniques of Food Analysis. Allied Scientific Publishers
- Rahman M S, (2007) Handbook of Food Preservation 2<sup>nd</sup> Edition by Taylor & Francis Group, CRC Press

## **Semester IV Group C**

### **APPLIED FOOD MICROBIOLOGY (Theory)**

Paper No.	:	1413 (c)
Maximum Marks	:	100
Teaching Periods	:	4 Periods/week
Teaching Load	:	48 classes

#### **OBJECTIVES**

- To study the microbial flora associated with food.
- To learn novel methods of Food Preservation.
- To study the relevance of microbiological safety of Food.
- To understand the conventional and advanced methods for detection of Food borne pathogens and their toxins.

#### **CONTENTS**

#### **PERIODS**

##### **UNIT I Microorganisms associated with foods**

- Bacteria, Fungi, Yeast and Viruses. **4**
- Cultivation of microorganisms at Lab and Industrial scale **6**
  1. Principle and functioning of a fermenter.
  2. Pilot, Lab and Industrial Scale fermenter.
  3. Baker's Yeast and Lactic acid bacteria.

##### **UNIT II Novel Methods in Food Preservation**

- Use of Biopreservatives: Antibiotics, Bacteriocins, Natural antimicrobials from plants. **4**
- Physical Methods: Aseptic Packaging, Hydrostatic Pressure Treatment, High Voltage Pulse Technique, Microwave Processing, Canning (12 D Concept). **4**

##### **UNIT III Food microbiological quality and safety:**

- Indicators of food quality and food safety- Coliforms, Enterococci, Bifidobacteria, coliphages. **4**
- The HACCP for food safety- Definitions, Principle, flow diagram, Application and Limitations; and FSO system. **5**

- ICMSF criteria for microbiological safety of food- Microbiological standards, Microbiological guidelines, Microbiological specifications, Microbiological criteria for various food products. **5**
- ICMSF sampling plan: Two class plan, Three class plan. **3**
- Elements of Good Manufacturing Practices (GMPs). **3**

#### **UNIT IV Techniques for detection of pathogens associated with food**

- Analysis of food for detection of Salmonella and E. coli **4**
- 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).**6**

#### **RECOMMENDED READINGS**

- Banwart GJ (1987) *Basic Food Microbiology*. CBS Publishers and Distributors.
- Frazier WC, Westoff DC. (1998) *Food Microbiology*. 4<sup>th</sup> ed. Tata McGraw-Hill Publishing Co. Ltd.
- Garbutt John (1997) *Essentials of Food Microbiology*. Arnold London
- Jay JM, Loessner DA, Martin J. (2005) *Modern Food Microbiology*. 7<sup>th</sup> ed. Springer.
- Prescott LM, Harley JP, Klein DA. (2008) *Microbiology*. 6<sup>th</sup> ed. WMC Brown Publishers.
- Schmidt, RH. Roderick, *Food Safety Handbook*, G.E. Wiley interscience, 2003, New Jersey.

## **PRACTICAL**

Paper No	:	1414 (c)
Maximum Marks	:	100
Practical	:	3 Practicals/week (3 periods/practical)
Practical load	:	36 practicals/ semester

### **a.FOOD PROCESING - II**

#### **OBJECTIVES**

- To understand processing and preservation technologies and used in milk and milk products and fruits & vegetable products.
- To gain knowledge of process optimization.

#### **CONTENTS**

#### **PERIODS**

##### **Unit I Milk and milk products technology**

- Chemical analysis of milk and determination of its components like fat, SNF, protein, TSS. 1
- Detection of preservatives in milk (boric acid and borate). 1
- Detection of adulterants in milk. 1
- Analysis of cheese, paneer, khoa as per BIS standards. 1
- Tests to judge the efficiency of pasteurization and homogenization.

##### **Unit II Fruits and Vegetable technology**

- Analysis of Proximate principles: Carbohydrates, sugars, ash, moisture, fat and protein. 2
- Experiment on control of enzyme activity, enzyme inactivation in fruits and vegetables. 2
- Estimation of acidity, total solids of different foods – Squashes, syrups and juices. 2
- Dehydration of fruits and vegetables and shelf life studies: its effect on colour, texture and flavour. Rehydration ratio, rehydration coefficient. 1
- Preservation of fruits and vegetables using low temperature. 1

- Preservation of fruits and vegetables using Heat, salt and sugar and estimation of effect of processing on nutrients and color:
- Processing of tomato products. 1
- Processing of jams, jellies and marmalades. 1
- Processing of pickles and brines 1

## **b. ADVANCED FOOD SCIENCE - II**

### **OBJECTIVES**

- To apply knowledge in application of various unit operations and to understand quantitative analysis of food constituents and trace elements.
- To perform food analysis using advanced techniques.
- To equip students with basic techniques in composition and analysis of foods.

### **CONTENTS**

### **PERIODS**

#### **UNIT I Low temperature processing/ by removal of heat**

- Visit to food processing industry to learn about heat exchangers, freezers, freeze drying and freeze concentration. 1

#### **Unit II: Fermentation**

- Leavening power of different leavening agents. 1

#### **UNIT III: Post processing operations**

- Estimation of salt content in brine. 1
- Estimation of total acidity, volatile acidity, fixed acidity and esters in alcoholic beverages. 2
- Analysis of water for its potability. Estimation of Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) of industry waste water 1
- Determination of porosity of tins and tin content of canned food samples. 1



- Determination of hardness of water. 1
- Determination of alkalinity of water. 1
- Determination of viscosity using Brookfield's viscometer. 1
- Determination of effect of temperature on viscosity. 1
- Determination of minerals: calcium and phosphorus. 1

### **c. APPLIED FOOD MICROBIOLOGY**

#### **OBJECTIVES**

- **Cultivation of microorganisms.**
- **Study of microorganisms commonly associated with foods.**
- **Environmental monitoring of a food manufacturing unit.**

#### **CONTENTS**

#### **PERIODS**

##### **UNIT I Microbial Growth**

**4**

- To study bacterial growth by Turbidometric method.
- To study the effect of pH and temperature on bacterial growth.
- To grow Brewer's Yeast and its applications in Alcoholic productions.

##### **UNIT II To study the diversity of Microorganisms associated with food samples.**

**5**

Isolation of Proteolytic, Lipolytic, Amylolytic, Halophilic, Osmophilic and Thermophilic organism from different food samples.

##### **UNIT III Environmental monitoring (College canteen/ Any food manufacturing unit)**

**3**

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

## **RECOMMENDED READINGS**

- Bell C, Neaves P, Williams AP. (2006) Food Microbiology and Lab Practice.
- Benson HJ (1990). Microbiological Applications. 5<sup>th</sup> ed. WMC Brown Dubugue.
- Cappuccino JG, Sharman N(2002). Lab Manual of Microbiology. Pearson Education Publishing Co.
- Yousef AL. (2003). Food Microbiology. A Laboratory Manual. Wiley Interscience New Jersey.

## **DISSERTATION**

<b>Paper No.</b>	:	<b>1415</b>
<b>Maximum Marks</b>	:	<b>150 (both for III and IV semester)</b>
<b>Teaching Period</b>	:	<b>4 periods/ week</b>
<b>Teaching Load</b>	:	<b>48 / semester</b>

### **OBJECTIVE**

- **To continue the research work initiated in Semester III and submit dissertation at the end of Semester IV.**

The students will be guided and supervised by a member of the teaching faculty of the concerned department. The dissertation in which the research culminates should reflect the student's own work.