
 <p>Estd. 1962 "A++" Accredited by NAAC(2021) With CGPA 3.52</p>	<p><b>SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA</b> PHONE : EPABX – 2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in <b>शिवाजी विद्यापीठ, कोल्हापूर - ४१६००४, महाराष्ट्र</b> दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दूरध्वनी विभाग २३१-२६०९०९३/९४</p>	
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SU/BOS/Science/

Date: **12 SEP 2022**

To,  
The Principal,  
All Affiliated Concerned Science Colleges/Institutions  
Shivaji University, Kolhapur.

**No 00164**

**Subject:** Minor Change in syllabi of **M. Sc. Part II - Food Science and Nutrition** degree programme under the Faculty of Science and Technology

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the Minor Change in syllabi of **M. Sc. Part II - Food Science and Nutrition** under the Faculty of Science and Technology.

1	M. Sc. Food Science and Nutrition <b>Part I</b>		M. Sc. Food Science and Nutrition <b>Part II</b>	
Sr. No.	Food Science and	Semester	Old Title	New Title
2	M. Sc. Food Science and Nutrition II	<b>III</b>	DSE 304 Public Health Nutrition	DSE 304 Clinical Nutrition
3	M. Sc. Food Science and Nutrition II	<b>IV</b>	DSE 404 Clinical Nutrition	DSE 404 Public Health Nutrition

This Course syllabi shall be implemented from the Second term of Academic Year 2022-2023 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website [www.unishivaji.ac.in](http://www.unishivaji.ac.in) (students Online Syllabus)

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

*(Signature)*  
Dy Registrar

Copy to:

1	The Dean, Faculty of Science & Technology	7	Appointment Section
2	Director, Board of Examinations and Evaluation	8	P.G.Seminar Section
3	The Chairman, Respective Board of Studies	9	Computer Centre
4	B.Sc. Exam	10	Affiliation Section (U.G.)
5	Eligibility Section	11	Affiliation Section (P.G.)
6	O.E. I Section	12	P.G.Admission Section



# SHIVAJI UNIVERSITY, KOLHAPUR.



Accredited By NAAC with 'A' Grade

CHOICE BASED CREDIT SYSTEM

Syllabus For

**M.Sc. (Food Science & Nutrition) II**

SEMESTER III AND IV

(Syllabus to be implemented from June, 2022 onwards.)

**M. Sc. (Food Science and Nutrition) (CBCS Pattern) - Course Structure**  
**M. Sc. Part I**

Semester I (Duration Six Months)		TEACHING SCHEME				EXAMINATION SCHEME						
TYPE	SR. NO	COURSE CODE	TITLE OF THE PAPER	Theory and Practical		External Assessment (EA)		Internal Assessment (IA)		Assessment		
				LECTURES (per week)	HOURS (per week)	CREDITS	Max. Marks	Min. Marks	Exam. Hours	Max. Marks	Min. Marks	Exam. Hours
CGPA	1	CC-101	Human Physiology	4	4	4	80	32	20	3	8	1
	2	CC-102	Food Preservation Techniques	4	4	4	80	32	20	3	8	1
	3	CC-103	Advanced Food Chemistry	4	4	4	80	32	20	3	8	1
	4	CC-104	Nutrition Through Life Cycle	4	4	4	80	32	20	3	8	1
	5	CCPR-105	Laboratory Course I	16	16	8	200	80	---	---	---	---
<b>Total(A)</b>				---	---	24	520	---	80	---	---	---
Non-CGPA	1	AEC-106	Communication English I	2	2	2	---	---	50	---	20	2
<b>Semester II (Duration Six Months)</b>												
CGPA	1	CC-201	Advanced Microbiology	4	4	4	80	32	20	3	8	1
	2	CC-202	Processing of Cereal, Legumes & Oilseeds	4	4	4	80	32	20	3	8	1
	3	CC-203	Processing of Fruits & Vegetables	4	4	4	80	33	20	3	8	1
	4	CC-204	Nutritional Biochemistry	4	4	4	80	32	20	3	8	1
	5	CCPR-205	Laboratory Course II	16	16	8	200	80	---	---	---	---
<b>Total (B)</b>				---	---	24	520	---	80	---	---	---
Non-CGPA	1	SEC-206	Fundamentals of Information Technology I	2	2	2	---	---	50	---	20	2
<b>Total (A+B)</b>						48	1040	---	160	---	---	---

**M. Sc. (Food Science and Nutrition) (CBCS Pattern) - Course Structure**  
**M. Sc. Part II**

Semester III (Duration Six Months)			TEACHING SCHEME			EXAMINATION SCHEME						
TYPE	SR. NO	COURSE CODE	TITLE OF THE PAPER	Theory and Practical		External Assessment (EA)			Internal Assessment (IA)			
				LECTURES (per week)	HOURS (per week)	Max. Marks	Min. Marks	Exam. Hours	Max. Marks	Min. Marks	Exam. Hours	
CGPA	1	CC-301	Research Methodology & Biostatistics	4	4	80	32	3	20	8	1	
	2	CCS-302	Processing of Milk & Milk Products	4	4	80	32	3	20	8	1	
	3	CCS-303	Food Additives, Contaminants & Toxicology	4	4	80	32	3	20	8	1	
	4	DSE-304	Public Health Nutrition	4	4	80	32	3	20	8	1	
	5	CCPR-305	A) Laboratory Course III + B) Project Phase I	8	8	100	40	---	---	---	---	
<b>Total (A)</b>				---	---	520	---	---	80	---	---	
Non-CGPA	1	AEC-306	Communication English II	2	2	---	---	---	50	20	2	
2				EC		SWAYAM/MOOC/Online						
<b>Semester IV (Duration Six Months)</b>				Number of Lectures & Credits will be specified on SWAYAM/MOOC/Online Courses								
CGPA	1	CC-401	Food Product Development & Packaging	4	4	80	32	3	20	8	1	
	2	CCS-402	Processing of Animal Foods	4	4	80	32	3	20	8	1	
	3	CCS-403	Functional Foods & Nutraceuticals	4	4	80	32	3	20	8	1	
	4	DSE-404	Clinical Nutrition	4	4	80	32	3	20	8	1	
	5	CCPR-405	A) Laboratory Course IV + B) Project Phase II	8	8	100	80	---	---	---	---	
<b>Total (B)</b>				---	---	520	---	---	80	---	---	
Non-CGPA	1	SEC-406	Fundamentals of Information Technology II	2	2	---	---	---	50	20	2	
2				GE-407		Food Analysis & Quality Control						
<b>Total (A*B)</b>						1040		160		---		

**Shivaji University, Kolhapur**  
**College of Non- Conventional Courses for Women, Kolhapur**  
**Department of Food Technology**  
**Syllabus and Scheme of examinations for Two year (Four Semesters)**  
**M. Sc. Degree Program in Food Science and Nutrition**  
**Choice Based Credit System**

**Preamble:**

The Master's program of Food Science and Nutrition provides professional education for those who wish to develop a carrier in: Food industry, New product Development, Clinical Nutrition, Public health Nutrition and Research. It focusses on the interface between food science and human nutrition and area of increasing importance to educators, health departments, consumer's, government and food industry. It builds on major concepts of nutritional biochemistry, nutrition and food science to discuss the roles of all nutrients, nutritional contents of food and diet in health and disease. The programme includes all the units of study to ensure the students to reach competence including public health, clinical nutrition, communication, research and evaluation. Shivaji University Kolhapur, Faculty of Science and Technology is offering M.Sc. degree in Food Science and Nutrition since inception with modifications in scheme and syllabus from time to time as needed to keep abreast with largest knowledge in the field. Since the subject has grown tremendously, there is a need to specialize within the subject and train students specifically for the job market.

The proposed M.Sc. Programme under CBCS scheme has a total of 96 credits consisting of CC, CCS, DSE.

**Eligibility Criteria:**

Minimum percentage is 55% or equivalent grade who have the following degrees- B.Sc. Food Technology and Management, Bachelor of Food technology and Management, B.Sc. Food

Technology, B.Sc. Food Science and Quality Control, B.Sc. Food Processing and Packaging, B.Sc. Foods and Nutrition, B.Sc. Food Science and Nutrition, B.Sc. Clinical Nutrition and Dietetics, / Nutrition and Dietetics, B.Sc. Public Health and Nutrition, B.Sc. Applied Nutrition, B.Sc. Home Science, B. Voc. Food Processing and Management (with 12<sup>th</sup> Science), B. Sc. Life Sciences/ Biochemistry/ Biotechnology / Microbiology/ Zoology/ Molecular Biology/ Botany/ Chemistry or equivalent.

**Intake Capacity: 30**

**PROGRAM OUTCOMES (POS), PROGRAM SPECIFIC OUTCOMES (PSO)**

<p><b>PROGRAM OUTCOMES (POS)</b></p>	<ol style="list-style-type: none"> <li>1. Utilize knowledge from the physical and biological sciences as a basis for understanding the role of food and nutrients in health and disease processes. Students will be able to prepare and deliver effective presentations of technical information to food science and nutrition professionals and to the general public.</li> <li>2. Students/ learners will gain a broad knowledge of food science focusing on chemistry, biochemistry, whilst giving them the necessary understanding of food processing, preservation techniques, quality, safety and new product development to excel in the field.</li> <li>3. Students/ learners will develop an in-depth understanding of the principles that underpin the relationships between diet, human health and wellbeing.</li> <li>4. Ability development of Students/ learners to critically appraise the effects of food processing on the nutritional quality of foods and the role of processed</li> </ol>
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	foods in the diet.
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<p><b>PROGRAM SPECIFIC OUTCOMES (PSO)</b></p>	<ol style="list-style-type: none"> <li>1. Able to provide nutrition counselling and education to individuals, groups, and communities throughout the lifespan using a variety of communication strategies.</li> <li>2. Able to apply technical skills, knowledge of health behaviour, clinical judgment, and decision-making skills when assessing and evaluating the nutritional status of individuals and communities and their response to nutrition intervention.</li> <li>3. Students can implement strategies for food access, procurement, preparation, and safety for individuals, families, and communities. Apply food science knowledge to describe functions of ingredients in food.</li> <li>4. Students/ learners will develop the ability to apply fundamental specific concepts to understand the complex characteristics of foods.</li> <li>5. The programme will allow the students to challenge current issues in food production and issues arising from food safety.</li> <li>6. The programme will encourage students to evaluate current issues and developments related to the nutrition discipline, and propose new insights and solutions to diet-related problems.</li> </ol>
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**CC-301: Research Methodology and Biostatistics**

**(4 credits, 60 lectures)**

**Course Outcome:**

1. Students will be able to identify the overall process of designing a research study from the inception to its report making.
2. Students will learn the characteristics of qualitative and quantitative research and will be able to identify a research problem stated in a study.
3. Students will understand advanced concepts of statistics and develop basic skills of data analysis.

**Unit I**

**(1 Credit, 15 lectures)**

Introduction to Research, Objectives and types of Research, Research Approach, Significance of Research, Research Methods versus Methodology, Research Process, Research Problem Selection, Necessity to define problem, Research Formulation, Research Design and Methods, Defining the Research Problem, Research Design, Need and Features of Good Design, Important concepts- Dependent and Independent variables, Extraneous Variables, Control, Confounded Relationship, Research Hypothesis, Experimental and Non experimental Hypothesis, Experimental and Control Groups, Treatments, Experiments, Experimental Unit; Different Research Designs, Basic principles of experimental designs, Important Experimental Designs.

**Unit II**

**(1 Credit, 15 lectures)**

Design of Sample Surveys- Introduction, Sample design, Sampling and Non Sampling Errors, Sample Survey Vs. Census Survey, Types of Sample Design, Non probability sampling, Probability Sampling, Complex Random Sampling Designs; Measurement and Scaling- Quantitative and Qualitative Data, Classification of Measurement Scales, Sources of error in Measurement, Techniques of developing measurement tools, Scaling, Scaling Techniques, Multidimensional Scale, Deciding the scale; Data Collection- Experiments and Surveys, Collection of Primary and secondary data, Data Preparation; Descriptive Statistics- Measures of

Central Tendency- Mean, Median, Mode, Other Average, Measures of Description- Range, Mean Deviation, Standard Deviation, Measures of Skewness, Kurtosis, Measures of Relationship

### **Unit III**

**(1 Credit, 15 lectures)**

Sampling and Statistical Inference- Parameter and Statistic, Sampling and Non Sampling Errors, Sampling Distribution; Degree of freedom, Standard Error, Central Limit Theorem; Testing of Hypothesis; Chi Square Tests, Analysis of Variance- ANOVA, Other Non Parametric Methods- Sign Tests, Wilcoxon Signed Rank Sum Test, Mann Whitney U test, Run Test, Kruskal Wallis Test, Spearman's Rank Correlation; Linear Regression Analysis; Multiple Linear Regression Model; Using SPSS

### **Unit IV**

**(1 Credit, 15 lectures)**

Factor Analysis- Centroid Method, Principal Components Method, Maximum likelihood Method, Rotation in Factor Analysis, R-Type and Q-type Factor Analysis, Merits and Demerits of Factor Analysis; Cluster analysis; Interpretation and Report Writing- Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Report Writing, Layout of Research Report, Types of Report, Oral Presentation, Mechanics of writing a Research Paper.

### **Suggested Reading,**

1. Kothari C.R, Garg G.,(2014), Research Methodology; New Age International Publication, New Delhi
2. ZinaO'Leary, (2004),The essential Guide to doing research; SAGE Publication
3. Rao S., Richard J., (2002), Introduction to Biostatics and Research Methods, Eastern economy edition.
4. Dr. Mishra S., Dr. Alok S., (2017), Handbook of Research Methodology, Educreation Publication.
5. Singh Y.K., (2010), Fundamentals of Research Methodology and Statistics, New Age International Publishers.
6. Dr. Achari P., (2012), Research Methodology, Horizon Books Publication.

7. Singh R., Reseach Methodology, (2012), R.T. Publication

**CCS- 302 Processing of Milk and Milk Products**

**(4 Credits, 60 lectures)**

**Course outcome**

1. Students will be able to understand the technology behind the production of various dairy products.
2. Students impart skills in the application of biological, chemical, biochemical, physical and engineering sciences in processing and preservation of milk and milk products.
3. Students will get acquainted with techniques and technologies of testing and processing of milk by products.

**Unit-I**

**(1 Credit, 15 Lectures)**

Status of Dairy Industry, MMPO, Milk cooperative system, NDDB, Definition, Sources, Composition, Nutritive Value, and Procurement of Milk Collection, chilling, transportation, cream separation, standardization, pasteurization, sterilization, UHT, homogenization, packaging, storage and distribution of fluid milk.

**Unit-II**

**(1 Credit, 15 lectures)**

Principles and practices of manufacture, packaging, storage and marketing of Cheese, processed cheese, Dahi, yoghurt, Shrikhand, etc. Sanitary aspects: sanitation of dairy plant building, equipment and their maintenance. Effluent treatment plant.

**Unit-III**

**(1 Credit, 15 lectures)**

Classification, manufacture, packaging, storage and marketing of ice cream, ices, sherbets etc. Defects of frozen products and their control. Technology of indigenous milk: products: Principles and practices of manufacture, packaging, storage and marketing of butter, ghee, khoa, Paneer channa and milk based foods.

**Unit-IV**

**(1 Credit, 15 lectures)**

Manufacture of evaporated milks and milk powders. Packaging storage, defects and their control. Technology of Dairy by- products:Utilization of skim milk, buttermilk and way for the manufacture of casein, lactose etc.

### **Suggested Readings:**

1. Sukumar De (1997), Outline of Dairy Technology, oxford University press
2. Cogan, T. M. (1995), Dairy Starter Cultures, VCH publishers
3. Gangasagare, Pandurang (2018), Textbook of Traditional Dairy Products, Oxford Book Company.
4. Mishra, Birendra (2016), Dairy and Food Product Technology, Biotech Books.
5. Kango Mangala (2006), Milk & Milk Products , RBSA publishers.
6. Robinson, R. K. Modern Dairy Technology Vol. I: Advances in Milk, Springer Science Business Media.
7. Robinson, R. K. Modern Dairy Technology Vol. II: Advances in Milk, Springer Science Business Media.
8. Patange, D. D.(2005), Textbook on Milk and Milk Products, Jaya publishing house.
9. Singh S. K. (2016), Analysis of Milk Chemistry, Oxford Book Company, Jaipur.
10. Johnson, Webb (1987), Fundamentals of Dairy Chemistry, CBS Publishers & Distributors, New Delhi.
11. Cleaence Henry Eckles, Willes Barnes Combs , (1997): Milk & Milk Products , Tata McGraw Hill Publishing Company
12. Gangasagare Pandurang (2016), Processing of Milk, Agrotech Press, Jaipur

## **CCS- 303 Food additives, contaminants and toxicology (4Credits 60 lectures)**

### **Course outcome**

1. Students will be able to understand that additives are relevant to processed food industry for shelf-life extension, processing aids and sensory appeal.
2. Students will get acquainted to develop an understanding of isolation of various biopolymers from food resources and their relevant application.
3. After completing the course students, a known – how on food additive legislation & understands the chemical & technological properties of the most relevant food additives used as food improvement agents.

### **UNIT-I**

**(1 Credit, 15 lectures)**

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

### **UNIT – II**

**(1 Credit, 15 lectures)**

Proteins, starches and lipids as functional ingredient; isolation, modification, specifications, functional properties and applications in foods and as nutraceuticals.

### **UNIT – III**

**(1 Credit, 15 lectures)**

Definition scope and general principles of food toxicology; manifestation of toxic effects; classification of food toxicants; factors affecting toxicity of compounds; methods used in safety evaluation-risk assessments.

## UNIT – IV

(1 Credit, 15 lectures)

Food contaminants, physical, chemical, microbial and other contaminants; food toxicants. Derived Food toxicants- Processing & Packaging; Toxicants generated during food processing such as nitrosamines, acrylamide, benzene, dioxins and furans; persistent organic pollutants.

### Suggested Readings:

1. Shakuntala Manay, Foods Facts and Principles (3<sup>rd</sup> Edition), New Age International Publishers.
2. S N Mahindru, (2017), Food Additives-Characteristics, Detection and Estimation, APH Publishing Corporation.
3. Branen AL, Davidson PM & Salminen S, (2001) Food Additives. (2nd Edition).
4. Madhavi DL, Deshpande SS & Salunkhe DK. 1996. Food Antioxidants: Technological, Toxicological and Health Perspective. Marcel Dekker.
5. P. V. Patil, Food Contamination, (2013), Aavishkar Publishers, Distributors.
6. Gerorge AB (1996), Encyclopedia of Food and Color Additives, Vol. III. CRC Press.
7. Gerorge AB. 2004. Fenaroli's Handbook of Flavor Ingredients. 5th Ed. CRC Press.
8. Vanisha Nambiar, (2004), A textbook on Food Contamination and Safety, Anmol Publications PVT. LTD. New Delhi.
9. Stephen AM. (Ed.). 2006. Food Polysaccharides and Their Applications.
10. Hathcock JN. (Ed.). 1982. Nutritional Toxicology. Vol. I. Academic Press.
11. S N Mahindru, (2017), Food Contaminants-Origin, Propagation & Analysis, APH Publishing Corporation.

**DSE-304: Clinical Nutrition****(4 Credits, 60 lectures)****Course Outcome:**

1. Students will be able to understand principles of diet therapy, modification of normal diet for therapeutic purposes and the role of dietician.
2. Students will be able to demonstrate counselling techniques to facilitate behaviour change.
3. Students can identify and describe the roles of others with whom the registered dietician collaborates in the delivery of food and nutrition services.

**Unit -1****(1 Credit, 15 lectures)**

Introduction to Diet Therapy, Nutrition Care Process, Menu Planning, Adjuncts to Diet Therapy, Therapeutic Nutrition- Definition of Therapeutic diet, Routine Hospital Diets, Route of administration- Enteral, Parenteral and Total Parenteral Nutrition, Difference between Enteral and Parenteral Nutrition, Advantages and Disadvantages of Therapeutic Nutrition, Role of a dietitian in Hospital, Patient care and Counselling, Eating Disorders- Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder- Definition, prevalence, causative factors, sign and symptoms, medical treatment, nutritional management; Adverse Food Reactions- Food Allergy and Intolerances; Food and Drug Interactions

**Unit -2****(1 Credit, 15 lectures)**

Diet in Infections and Fever: Typhoid, Malaria, Influenza, Tuberculosis, Dengue Fever, COVID-19, Swine flu- Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management.

Diet in Weight Imbalance- Obesity and Underweight: Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management and Dietary Guidelines, Diet in Cardiovascular Diseases: Atherosclerosis, Role of fat in Atherosclerosis,

Coronary Heart Diseases- Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management Dietary Guidelines, Myocardial Infarction, Hypertension- Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management, DASH Diet.

Diet in Gastrointestinal Diseases- Indigestion, GERD, Peptic Ulcer, Diverticular Disease, Constipation, Diarrhoea, Inflammatory Bowel Disease, Dumping Syndrome: Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management, Dietary Guidelines

### **Unit -3**

**(1 Credit, 15 lectures)**

Diet in Diseases of Liver and Pancreas- Jaundice, Infective Hepatitis, Liver Cirrhosis, Hepatic Coma, Cholecystitis, Cholelithiasis, Pancreatitis: Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management, Diet in Gout, Diabetes Mellitus type 1 and 2, Gestational Diabetes: Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management, dietary guidelines.

Diet in Diseases of Kidneys- Functions of Kidney, Glomerulonephritis, Nephrotic Syndrome, Acute Renal Failure, Chronic Renal Failure, Dialysis and Renal Transplant, Kidney Stones- Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management.

### **Unit -4**

**(1 Credit, 15 lectures)**

Diet in Cancer- Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment and surgical management, nutritional management, Immunonutrients in Cancer.

Diet in Thyroid Disorders- Hyperthyroidism and Hypothyroidism: Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management.



Diet in PCOS- Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management.

Diet in Critical Care- Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management.

Diet in Neurological Disorders- Epilepsy, Alzheimers Disease, Multiple Sclerosis, Parkinsons Disease, Head Trauma, Bipolar Disorder, Migrain: Definition, prevalence, Pathophysiology, aetiological factors, sign and symptoms, medical treatment, nutritional management.

#### **Suggested Reading,**

1. Krause and Mahan, (2015), Food and Nutrition Care Process, 14<sup>th</sup> edition; Elsevier, New York.
2. Shrilaxmi B, (2019), Dietetics, New Age International Publishers, New Delhi, India
3. Joshi S., (2015), Nutrition and Dietetics, Mc Graw Hill Education, India
4. Agarwal S., Udipi S., (2014), Human Nutrition, Jaypee Publication, New Delhi, India
5. Gandy G., (2010), Oxford Handbook of Nutrition and Dietetics; Oxford Publication, UK
6. Width M, Reinhard T, (2012), The Essential Pocket Guide for Clinical Nutrition, Oxford, UK
7. Shrilakshmi B, (2019), Nutrition Science, New Age International Publishers, New Delhi, India.

**CCPR 305 LABORATORY COURSE III**

**(4 Credits 60 hours)**

**Group A**

Platform tests in milk

Estimation of fat and SNF from milk

Preparation and evaluation of flavoured milk

Preparation and evaluation of lassi

Preparation and evaluation of paneer and Channa

Preparation and evaluation of khoa and gulabjamun

Preparation and evaluation of chakka and Shrikhand

Determination of titrable acidity and specific gravity of milk

**Group B**

Estimation of preservatives from food

Estimation of sweeteners from food

Estimation of colors from food sample

Estimation of fibers from food sample

Estimation of flavor enhancer

Estimation of Antioxidants

Extraction of essential oil and oleoresins

Applications of additives and ingredients in foods

**Group C**

Therapeutic Diets

Diet in Typhoid

Diet in Tuberculosis  
Diet in Dengue Fever  
Diet in Obesity  
Diet in Underweight  
Diet in Myocardial Infarction  
Diet in Hypertension  
Diet in Hepatitis  
Diet in Gall Bladder Disease

**Seminars based on above groups**

**AEC-306: Communication English-II**

**(2 Credits, 30 Hours)**

**EC: SWAYAM/MOOC/ONLINE**

**Number of Lectures and Credits will be specified by Course**

## **CC 401: Food Product Development & packaging (4 credits, 15 lectures)**

### Course outcome

1. Student will be able to understand the need for packaging food, understand the various functions of food packages as influenced by their characteristics, understand the health implications of food-package interactions.
2. Students will be able to understand different functions performed by packaging material.
3. Students will be able to understand health implications of food-package interactions.
4. Students learn about packaging requirement for fresh and processed food for local and international markets.

### **UNIT I**

**(1 credit, 15 lecture)**

Definition & need for product development, classes & characteristics of New food products, ethics in food product development, stages/ phases of new product development- idea generation, screening, feasibility studies, consumer research, financial review, product design & formulation, process development- recipe development & scale up, consumer trials, market testing, quality assessment of new developed products- sensory evaluation, shelf life testing, costing/ pricing & economic evaluation of the product

### **UNIT II**

**(1 credit, 15 lectures)**

Functions & objectives of packaging, forms of packaging- rigid, semi- rigid, flexible, packaging closures & sealing systems, packaging requirements & selection of packaging

materials, Types of packaging materials: Paper: pulping, fibrillation and beating, types of papers and their testing methods; Glass: composition, properties, types of closures, methods of bottle making; Metals: Tinplate containers, tinning process, components of tinplate, tin free steel (TFS), types of cans, aluminum containers, lacquers; Plastics: types of plastic films, laminated plastic materials, co-extrusion, edible films, biodegradable plastics.

### **UNIT III**

**(1 credit, 15 lectures)**

Properties of materials such as tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, their methods of testing and evaluation; Barrier properties of packaging materials: Theory of permeability, factors affecting permeability, permeability coefficient, gas transmission rate (GTR) and its measurement, water vapour transmission rate (WVTR) and its measurement, prediction of shelf life of foods, selection and design of packaging material for different foods.

### **UNIT IV**

**(1 credit, 15 Lectures)**

Packaging equipment and machinery: Vacuum, CA and MA packaging machine; gas packaging machine; seal and shrink packaging machine; form and fill sealing machine; aseptic packaging systems; bottling machines; carton making machines.

### **Suggested Readings**

1. Avantina Sharma (2018), Food Product Development, CBS Publishers and Distributors.
2. Fuller G W (1994), New Food Product Development : From Concept to Market place  
CRC Press, New York
3. Man C M D, Jones A A (1994), Shelf life Evaluation of Foods. Blackie Academic and Professional, London
4. Olickle, J K (1990), New Product Development and value added. Food Development Division, Agriculture, Canada

5. Graf E and Saguy I S (1991), Food Product Development : From concept to the Market Place, Van Nostrand Reinhold New York
6. Jacqueline H. Beckley, M. Michele Foley Elizabeth J. Topp & J. C. Huang Witoon Prinyawiwatkul (2007), Accelerating New Food Product Design and Development. Blackwell Publishing Company. IFT Press. USA
7. Howard R. Moskowitz, I. Sam Saguy & Tim Straus (2009), An Integrated Approach to New Food Product Development, Taylor and Francis Group, LLC.USA

**CCS 402: Processing of animal foods**

**(4 credits, 15 lectures)**

**Course outcome**

1. Student will be able to understand the importance of meat, preservation and processing into different products.
2. Students provide insight into the functions and areas of responsibility of meat inspection.
3. Students will get acquainted with an understanding of the technology for handling, processing, preservation and bi-product utilization of meat, poultry and fish products processing.
4. Combination of theoretical & practical sessions consisting of the analysis of case studies, laboratory work, use of computer software & technical visits.

**Unit-I**

**(1 credit, 15 lectures)**

Slaughter and census of meat animals. Components of carcass viz. muscles, postmortem glycolysis. Conversion of muscle of meat, pre and post slaughter factors affecting quality of meat, color, texture, WHC, organoleptic characteristics, PSE and DFD conditions. Preservation of meat and meat products, Meat analogue and their processing. Effect of processing parameters on product constituents, viz. lipid, protein, carbohydrates and flavor, sensory evaluation, guidelines, different tests, hedonic testing etc.

**Unit-II**

**(1 Credit, 15 lectures)**

Status of poultry industry in India and abroad. Pre slaughter care, ante mortem examination

slaughter, dressing and postmortem. Composition and chemistry of chicken muscle, pre and post slaughter factors affecting poultry meat quality, Chilling and freezing of poultry meat; packaging and grading of poultry meat. Preparation of poultry products: cured, smoked, canned barbecue and curried poultry.

### **Unit–III**

**(1 credit, 15 lectures)**

Structure, composition and nutritive value of egg, egg proteins and functional properties of eggwhite and yolk. Factor affecting egg quality and their measurements. Industrial uses of eggs. Collection, grading, cleaning, washing, packaging and transportation of eggs, preparation of egg products. Preservation of shellegg. Microbial spoilage of egg and egg; products. Preparation poultry products.

### **Unit –IV**

**(1 credit, 15 lectures)**

Muscle structure, composition, nutritive value, processing operations, Post- mortem chemistry of marine foods, Microbiology & safety of marine foods, grading of marine foods, Storage & preservation techniques, Marine food products, By- product utilization

### **Suggested Readings:**

1. P. Sinha(2018), Fish processing & preservation, APH Publishing Corporation.
2. Mandal Pratibhat Kumar, (2018), Handbook of Meat Science, stadium press India Pvt Ltd.
3. A.L. Winton, K.B. Winton,(1993), The structure & composition of animal products , Agro botanical Publishers.
4. Norman N. Potter and Joseph H. Hotchkiss (1986), Food Science, Fifth Edition New York.
5. Manay, N. Shakuntala (2000), Foods Facts & Principles, New Age International Publishers

6. Herbart W.Ockerman, Conly L. Hansen (2000), Animal By-Product Processing & Utilization , CRC press, Delhi.
7. Forrest J C. (1975), Principles of Meat Science. Freeman
8. KerryJ. etal. (2002). Meat Processing. Woodhead Publication. CRC Press. Delhi.
9. Norman N Potter, Joseph Hotchkiss (1996), Food Science, CBS Publishers & distributors

### **CCS 403 FUNCTIONAL FOODS AND NUTRACEUTICALS (4 Credits: 60 Lectures)**

#### **Course Outcome-**

1. Student will gain the knowledge about Functional Foods and Nutraceuticals
2. Students will understand relationship between Disease, Maintenance of Health and Functional Food.
3. Students will be able to study application of Functional Foods and Nutraceuticals.

#### **UNIT I**

**(1 Credit: 15 Lectures)**

Functional Food and Nutraceuticals- Definition, history, types and classification. Perceived effect of diet on disease prevention, Understanding benefits of functional foods and nutraceuticals, Polyphenols: Flavonols, Catechins, Isoflavons, Tannins; Phytoestrogens, Phytosterols, Glucosinolates

#### **UNIT II**

**(1 Credit: 15 Lectures)**



Introduction to Probiotics, Prebiotics and Symbiotics. Probiotics: Taxonomy and Important Features of Probiotic Microorganisms, Health effects of Probiotic Microorganisms, Probiotics in various foods, Quality Assurance of Probiotics and Safety, Probiotics: Non digestible Carbohydrates/ Olligosaccharides, Prebiotics: Dietary Fibres, Resistant Starch, Gums

### **UNIT III**

**(1 Credit: 15 Lectures)**

Pigments: Carotenoids, Lycopene, Curcumin; Organosulphur Compound, Introduction to Antinutritional Factors, Phytates; Enzymes, Protease inhibitors, Amylase Inhibitors, Proteins and Peptides, Vitamins and Minerals, Non Nutrient Effect of Specific Nutrients: Conjugated Linoleic Acid, Omega 3 fatty acids

### **UNIT IV**

**(1 Credit: 15 Lectures)**

Saponins, Haemagglutinins, An introduction to Active Biodynamic Principles in Spices, Condiments and in Plant extracts; Resveratrol, Kaempferol, Quercetin, Cinnamaldehyde, Crocin, Lutoline, Capsaicin, Piperine, Gingerol, Eugenol, Rosmarinic acid, Apigenine, Thymoquinone, Fenugreek and Diosgenin

### **Suggested Readings:**

1. Wildman, R.E. (2016). Handbook of Nutraceuticals and Functional foods. CRC Press
2. Gibson, G.R and Williams, M.C. (2001). Functional Foods Concept to Product. CRC Press
3. Vatter, D.A and Maitin V. (2016). Functional foods, Nutraceuticals and Natural Products, Concept and Applications. DEStech Publications, Inc.
4. Gupta R.C. (2016), Nutraceuticals: Efficacy, Safety and toxicity. Academic Press
5. Egbuna C. and Tupas G., (2001), Functional Foods and Nutraceuticals Bioactive Components, Formulations and Innovations, Springer
6. Swaroop A., Bagchi D., Preuss H., (2015), Nutraceuticals and Functional Foods in Human Health and Disease Prevention, CRC Press, New York

7. Shi J., (2006), Functional Food Ingredients and Nutraceuticals: Processing Technologies, CRC Press, New York.
8. Konishi T., Bagchi D., Ghosh D., (2014), Clinical Aspects of Functional Foods and Nutraceuticals, CRC Press, New York

**DSE--404: Public Health Nutrition**

**(4 Credits, 60 lectures)**

**Course Outcome:**

1. Students will focus on promotion of good health through nutrition and the primary prevention of nutrition related problems.
2. Students will deal with nutritional epidemiology and also will understand public policies relevant to nutrition.

**Unit I**

**(1 Credit, 15 lectures)**

Principles of epidemiology and epidemiologic methods, Nutrition Epidemiology in developing countries, Under-nutrition in children

**Unit II**

**(1 Credit, 15 lectures)**

Dual nutrition burden in women: causes, consequences and control measures, Measuring under-nutrition and over-nutrition in children

**Unit III**

**(1 Credit, 15 lectures)**

Essential new-born care and child survival, Integrating breastfeeding in public health programming, complementary feeding of infants and young children, Prevention and Management of Protein Energy Malnutrition

**Unit IV**

**(1 Credit, 15 lectures)**

Nutritional Deficiency Disorders Control Programmes in India, Food and Nutrition Security in India, Monitoring and evaluation of Public health nutrition programmes, Nutrition-Health education, Integrated Child Development Services Scheme (ICDS), National Rural Health Mission

**Suggested Readings:**

1. Vir S., (2012), Public Health Nutrition in Developing Countries Part 1 and 2; Woodhead Publishing India Pvt. Ltd, New Delhi, India
2. K Park, (2015), Preventive and Social Medicine, 26<sup>th</sup> Edition; Bhanot Publication, India
3. Eldelstein S, (2012), Nutrition in Public Health; Jones and Bartlett Publishers, United States
4. Swaminthan (1995), Food and Nutrition Volume I and II, The Bangalore Press, India.
5. Buttriss J, Welch A., Kearney J., (2017), Public Health Nutrition, John Willey Publisher, London
6. Sabarwal B, (2018), Public Health and Nutritional Care, Arjun Publishing House, India
7. Schneider M., (2013), Introduction to Public Health, Jones and Bartlett Publisher, United States

**CCPR 405 LABORATORY COURSE IV**

**(4 Credits 60 hours)**

**Group A**

Identification and testing of Packaging materials

Determination of wax from wax paper

Testing of Lacquered tin plate sheets

Measurement of Tin coating by Clark's method

Determination of water vapor transmission rate of Packaging material

To perform vacuum packaging of Food sample and carry out its storage study

Testing of Compression strength of Boxes

Packaging of food material in seal and shrink-packaging machine and study its shelf life

**Group B**

Inspection and grading of eggs

Development and preparation of Meat products

Development and preparation of poultry food products

Development and preparation of Fresh water and marine food products

Preparation of preserved meat, poultry and marine food products

**Group C**

Diet in Hepatic Coma

Diet in Pancreatitis

Diet in Type 1 Diabetes Mellitus

Diet in Type 2 Diabetes Mellitus

Diet in Gout

Diet in Acute Renal Failure

Diet in Chronic Renal Failure

Diet in Cancer

Diet in Hypothyroidism

Diet in Hyperthyroidism

**Seminar on above groups**

**SEC-406: Fundamentals of Information Technology – II (2 Credits, 30 Hours)**

**GE-407: Food Analysis and Quality Control (2 Credits, 30 Hours)**

