ROYAL GLOBAL UNIVERSITY
GUWAHATI

ROYAL SCHOOL OF MEDICAL & ALLIED SCIENCES (RSMAS)

Department of Nutrition & Dietetics

SYLLABUS

&

COURSE STRUCTURE

M.Sc. in Nutrition & Dietetics

W.E.F. 2023-24

TABLE OF CONTENTS

Sl No.	Contents	Page No
1	Preamble	3
2	Introduction	3
3	Aim of the PG course in Nutrition & Dietetics	3
4	Career Opportunities in Nutrition & Dietetics	4
5	Vision & Mission	4
6	Post Graduate Attributes	5-6
7	Program Learning Outcomes	7
8	Credit Distribution	8
9	Scheme of Evaluation	8
10	Program structure	9-10
11	Detailed syllabus of Semester-I	11-20
12	Detailed syllabus of Semester-II	21-30
13	Detailed syllabus of Semester-III	
14	Detailed syllabus of Semester-IV	

M.Sc. in Nutrition & Dietetics

1. Preamble

The post graduate program in Nutrition and Dietetics has been designed to provide students a vast scope ranging from alleviation of malnutrition, preventive, promotive and therapeutic care in hospitals, in food industries as well as food service managers in various establishments. The specialists in Nutrition and Dietetics play a vital role in promoting the quality of life of individuals and communities, which contributes significantly to the economic and overall development of the nation.

The major objective of the programme is as follows:

1. To impart knowledge and develop capacities of the students through state of the art higher education in the area of Nutrition and Dietetics
2. To provide practical, field level experience in hospitals and food service establishments
3. To provide professionally competent manpower for academic and research institutions; hospitals and food industries; nutrition and health programs; food safety and quality control; consultancy and entrepreneurship
4. To plan a therapeutic diet according to the individual's requirement in health and disease conditions
5. To provide adequate nutritional counseling and to evaluate the nutritional needs of people of all age group. Therapeutic diet counseling of patients in the outpatient department

2. Introduction

The science that focuses on everything linked to food and its impact on our health and general wellbeing is called nutrition and dietetics, which is a branch of medicine. Dietitians and nutritionists work to promote healthy eating and assist people make better dietary decisions. Additionally, they support patients in finding a balance between healthy food and exercise.

3. Aim of the Post Graduate Degree Programme in Nutrition & Dietetics:

The aim of the postgraduate degree in Nutrition & Dietetics is to make the students gather knowledge and understand the various basic concepts innutrition & Dietetics. The students are required to improve upon their skills in handling laboratory instruments and learn about the principles and mechanism of working of the instruments. The understanding, knowledge and skills in planning nutrition in normal and therapeutic conditions through a well

developed teaching learning processes in the class. Practical skills will be obtained through laboratory work and presentation and articulation skills through various seminars and internship exposure. The students will also be mentored and guided through research projects in their final year of study.

4. **Career Opportunities:** Various scopes of career opportunities in Nutrition & Dieteticsare as follows.

- Nutritionists
- Dieticians
- Nutrition counsellor
- Nutrition programme planner
- Food Biochemists
- Food Microbiologists
- Food Quality Control Managers
- Food Inspector
- Production Manager
- Academics
- Entrepreneurs in the field

5. **Vision and Mission:**

VISION:

To create a cadre of nutritional professionals and integrate nutritional therapy widely in health care.

MISSION:

The Department of Nutrition and Dietetics is committed to:

- Create and share nutritional knowledge to ensure healthy and quality life
- Promote quality nutritional research

Students can also pursue higher studies such as Ph.D. programme in Nutritio& Dietetics or in allied sciences.

6. Post -Graduate Attributes:

The Learning Outcomes Descriptors and Post Graduate Attributes

Sl.no.	Post Graduate Attribute	The Learning Outcomes Descriptors *(The post graduates should be able to demonstrate the capability to)*
PGA1	Disciplinary Knowledge	Acquire knowledge and coherent understanding of the chosen disciplinary/interdisciplinary areas of study.
PGA 2	Complex problem solving	Solve different kinds of problems in familiar and non-familiar contexts and apply the learning to real-life situations.
PGA 3	Analytical & Critical thinking	Apply analytical thought including the analysis and evaluation of policies, and practices. Able to identify relevant assumptions or implications. Identify logical flaws and holes in the arguments of others. Analyse and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples.
PGA 4	Creativity	Create, perform, or think in different and diverse ways about the same objects or scenarios and deal with problems and situations that do not have simple solutions. Think 'out of the box' and generate solutions to complex problems in unfamiliar contexts by adopting innovative, imaginative, lateral thinking, interpersonal skills, and emotional intelligence.
PGA 5	Communication Skills	Listen carefully, read texts and research papers analytically, and present complex information in a clear and concise manner to different groups/audiences. Express thoughts and ideas effectively in writing and orally and communicate with others using appropriate media.

PGA 6	Research-related skills	Develop a keen sense of observation, inquiry, and capability for asking relevant/ appropriate questions. Should acquire the ability to problematize, synthesize and articulate issues and design research proposals, define problems, formulate appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict cause-and-effect relationships. Should develop the ability to acquire the understanding of basic research ethics and skills in practicing/doing ethics in the field/ in personal research work.
PGA 7	Collaboration	Work effectively and respectfully with diverse teams in the interests of a common cause and work efficiently as a member of a team.
PGA 8	Leadership readiness/qualities	Plan the tasks of a team or an organization and setting direction by formulating an inspiring vision and building a team that can help achieve the vision.
PGA 9	Digital and technological skills	Use ICT in a variety of learning and work situations. Access, evaluate, and use a variety of relevant information sources and use appropriate software for analysis of data.
PGA 10	Environmental awareness and action	Mitigate the effects of environmental degradation, climate change, and pollution. Should develop the technique of effective waste management, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.

7. Programme Learning Outcomes relating to M.Sc degree programme in Nutrition and Dietetics.

Students post graduating with the degree M.Sc.(Nutrition and Dietetics) will be able to achieve the following:

PLO1: Knowledge of Nutrition and Dietetics**:** Students are able to demonstrate comprehensive knowledge and understanding of one or more disciplines such as chemistry, biochemistry, mathematics, statistics, microbiology, management; regulations with support of different allied subjects of Life Science, Physical Science.

PLO2: Develop the ability to solve complex problems: Identify, formulate, review research literature, and analyze diet related problems and design solutions to meet the specified dietary needs with appropriate consideration for the food sustainability and optimal health.

PLO3: **Develop Critical thinking and analytical reasoning ability:** Recognize the need for, and have the preparation and ability to engage in independent/ as an entrepreneur and life-long learning in the broadest context of nutritional and technological change, logical reasoning and capability of recognizing and distinguishing the various aspects of real-life problems.

PLO4: Develop the ability to create: Recognize new skills, ideas and technologies and its implementation in new product developments**.**

PLO5: Communication Skills: Communicate effectively and write effective reports and design documentation, make effective presentation through seminars, project dissertations

PLO6: Develop Research related skills: Acquire the practical knowledge and demonstrate the ability to design, conduct/ troubleshoot experiments and analyze in the field of Nutrition and Dietetics.

PLO7: Develop the skills for collaborative work and team building: Work effectively with healthcare organizations, food industries, laboratories and production processing team to build the technical and practical learning aspects.

PLO8: **Develop Leadership qualities:** Work effectively with the team work and building capabilities and leadership qualities for achieving the vision**.**

PLO9: Develop Digitaland technological skills: The completion of this programme will enable the learner to use appropriate software to apply for nutrition and dietary modules to work in community/healthcare organization.

PLO10: Develop Environmental awareness and imbibe skills for addressing the problems: Examining the role of health consciousness, environmental awareness and intention on purchase of organic food

8. CREDIT DISTRIBUTION

SEMESTER	CREDITS
I	22
II	24
III	27
IV	29

TOTAL CREDITS=102

9. Assessment and Evaluation:

Scheme of Evaluation

The following suggestive table indicates the distribution of marks for various components in a semester

	Component of Evaluation	Marks	Frequency	Code	Weightage (%)
A	**Continuous Evaluation**				
i	Analysis/Class test	Combination of any three from (i) to (v) with 5 marks each	1-3	C	25%
ii	Home Assignment		1-3	H	
iii	Project		1	P	
iv	Seminar		1-2	S	
v	Viva-Voce/Presentation		1-2	V	
vi	Mid term examination	MSE shall be of 10 marks	1-3	Q/CT	
vii	Attendance	Attendance shall be of 5 marks	100%	A	5%
B	Semester End Examination		1	SEE	70%
	Project				**100%**

M.Sc. Nutrition & Dietetics

Programme Structure

1st semester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							
1	NDC154C101	Life Cycle Nutrition	3	1	0	4	4
2	NDC154C102	Advances in Nutritional Biochemistry	3	1	0	4	4
3	NDC154C103	Human Nutrition	3	1	0	4	4
5	NDC154C114	Practical I :Laboratory Techniques	0	0	8	4	8
Ability Enhancement Compulsory Courses (AECC)							
6	CEN984A101	Communicative English – I	1	0	0	1	1
7	BHS984A103	Behavioral Science – I	1	0	0	1	1
Discipline Specific Elective (DSE) (any one course)							
8	NDC154D101	Food Science	3	1	0	4	4
9	NDC154D102	Food Microbiology	3	1	0	4	4
		TOTAL CREDIT	**14**	**4**	**8**	**22**	**26**

2nd semester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							
1	NDC154C201	Physiological Aspects of Nutrition	3	1	0	4	4
2	NDC154C202	Research Methodology and Statistics	3	1	0	4	4
3	NDC154C203	Advances in Therapeutic Nutrition I	3	1	0	4	4
4	NDC154C214	Practical II: Normal and Therapeutic Diets	0	0	8	4	8
Ability Enhancement Compulsory Courses (AECC)							
5	CEN984A201	Communicative English – II	1	0	0	1	1
6	BHS984A123	Behavioral Science – II	1	0	0	1	1
Ability Enhancement Elective Courses (AEEC)							
7		(AEEC/SEC)	2	0	0	2	2
		Discipline Specific Elective (DSE) (any one course)					
8	NDC154D201	Food Processing &Preservation	3	1	0	4	4
9	NDC154D202	Sensory Evaluation					
		TOTAL CREDIT	**16**	**4**	**8**	**24**	**28**

3rd semester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							
1	NDC154C301	Community & Public Health Nutrition	2	1	0	3	3
2	NDC154C302	Advances in Therapeutic Nutrition II	2	1	0	3	3
3	NDC154C313	Practical III: Nutritional Status and Advanced Therapeutic Diets	0	0	4	2	4
Ability Enhancement Compulsory Courses (AECC)							
4	CEN984A301	Communicative English – II	1	0	0	1	1
Discipline Specific Elective (DSE)							
5		(AEEC/SEC)	2	0	0	2	2
		Discipline Specific Elective (DSE) (any three courses)					
6	NDC154D301	Cereal, Pulses & Oilseeds Processing	3	1	0	4	4
7	NDC154D302	Product Development	3	1	0	4	4
8	NDC154D303	Nutraceuticals & Health Foods	3	1	0	4	4
	NDC154D304	Sports Nutrition	3	1	0	4	4
9		Minor Project/6 week internship after 2nd semester end examination	0	0	10	4	10
			0	0	12	6	
		TOTAL CREDIT	**18**	**3**	**14**	**27**	**35**

4th semester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							
1	NDC154C401	Institutional Food Service Management	2	1	0	3	4
2	NDC154C402	Food Safety & Quality Control	2	1	0	3	4
3	NDC154C413	Practical IV :Institutional Food Service management and Food Safety	0	0	4	2	4
Ability Enhancement Compulsory Courses (AECC)							
3	CEN984A401	Communicative English	1	0	0	1	1
Elective: Discipline Specific (DSE) (Any Three)							
4	NDC154D401	Animal Product Processing and Utilization	3	1	0	4	4
5	NDC154D402	Food Packaging & Labelling	3	1	0	4	4
6	NDC154D403	Diet Counselling	3	1	0	4	4
7	NDC154D404	Geriatric Nutrition	3	1	0	4	4
		Food Enterprize					
	Project Dissertation						
5	NDC154C421	Major	0	0	10	8	10
		TOTAL CREDIT	**16**	**3**	**14**	**29**	**35**

SYLLABUS (1ST SEMESTER)

Subject Name: Life Cycle Nutrition	**Scheme of Evaluation: (T)**
Subject Code: NDC154C101	**Credit Units: 3-1-0-4**

Course Objective:

Understand growth and development and nutritional requirement from pregnancy to elderly

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the nutritional requirement during life cycle	**BT 1**
CO 2	**Understand** the growth & development, RDA during different stages of life.	**BT 2**
CO 3	**Apply** the basic knowledge about nutritional requirement	**BT 3**
CO 4	**Analyse** the situation of deficiency and excess and consequences	**BT 4**
CO 5	**Evaluate** the functions and significance of different nutrients ,RDA and their effects in deficiencies and excess**.**	**BT 5**

Detailed Syllabus:

Modules	Topics / Course content	Periods
I	**Nutrition during Pregnancy**: Prenatal growth and development, Nutritional requirements, RDA, Weight gain during pregnancy, Relationship between maternal and foetal nutrition, Teenage pregnancy and diet, General gastro intestinal problems, complications of pregnancy. **Nutrition during Lactation**: Physiological process of lactation, Nutritional requirements, RDA, Breast feeding- Colostrum and mature milk. Advantages of breast feeding- Nutritional benefit, hormones and growth, immunological benefits, psychological and economic, environmental benefits, infant and child morbidity. Barriers to breast feeding, Low milk production.	**12**
II	**Nutrition during Infancy**: Infant growth and Physiological development, Nutritional requirements for growth, RDA, Artificial feeding. Low birth weight and Preterm baby- Nutritional requirements, feeding the preterm baby, feeding problems. Weaning- Need for weaning, types of supplementary foods, problems in weaning. Nutrition in Preschool children: Growth and development, nutritional requirements, RDA, feeding dental problems and decay. Nutrition related problems of preschool children – Protein energy malnutrition- Types, symptoms, nutritional requirements and treatment.	**12**
III	**Nutrition in School children**: Nutritional requirements, RDA, Feeding problems, Packed lunches, Supplementary foods.	**12**

	Nutrition in Adolescents: Growth and development, Nutritional requirements, RDA, Nutritional problems- Obesity, eating disorders, predisposition to osteoporosis, anaemia, under nutrition, pre-menstrual syndrome, mal nutrition due to early marriage.	
IV	**Nutrition in Adults**: Growth and development, Nutritional requirements, RDA. **Nutrition in Old age:** General physiological changes, Theories on the causes of aging, Nutritional requirements, Nutrition related problems of old age, Degenerative diseases. Alzheimer's disease- Cause, physical effects and nutrition consideration. Guidelines for promoting healthful eating in old age, Exercise in old age.	**12**
Total		**48**
Pedagogy: Lectures, Assignments, Seminars		

Text Books:

1. Gordon. M. Wardlaw et.al; Contemporary Nutrition, 2nd edition, Publishing by Mosby, 2004.
2. Srilakshmi. B; Dietetics, 7th edition,New Age International (P) Limited Publishers, 2014.

Reference Books:

1. William's Nix; Basic Nutrition and Diet therapy, 14th edition, Published by Mosby, 2013.
2. MahtabS.Bamji, Prasad Rao, N.Vinodini Reddy; Textbook of Human Nutrition, Second Edition Oxford and IBH Publishing Co. Pvt .Ltd, 2003.
3. Nutrient Requirement and Recommend Dietary Allowances for Indians by Indian council of Medical research, National Institute of nutrition, Hyderabad.

Subject Name: Advances in Nutritional Biochemistry	**Scheme of Evaluation: (T)**
Subject Code: NDC154C102	**Credit Units: 3-1-0-4**

Course Objective: The course is designed with the following major objectives

To understand the structure, functions, effects of deficiency and excess of macronutrients in human body.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the functions of macronutrients in human body	**BT 1**
CO 2	**Understanding** the different types of micronutrients, significance & health benefits	**BT 2**
CO 3	**Apply** the knowledge of macronutrients	**BT 3**
CO 4	**Analyse** the different food processing techniques, novel food processing, their parameters, advantages and disadvantages	**BT 4**
CO 5	**Evaluate** the different status during life cycle with deficiency & excess	**BT 5**

Detailed Syllabus:

Modules	Topics / Course content	Periods
I	**Water & electrolytes:** Fluid comportments, distribution, water Intake & output, water balance, Composition of electrolytes in fluid compartments, buffer system, acid base balance-blood & kidney, imbalance disorders-dehydration & oedema. Enzymes – Classification and Role of Enzymes. **Carbohydrate metabolism:** Classification, Review of digestion and absorption. oxidation of glucose – glycolysis, oxidative decarboxylation, citric acid cycle. Pentose phosphate pathway. Glycogen- Glycogenesis, Glycogenolysis. Gluconeogenesis. Inborn errors of metabolism. Glycogen storage diseases.	**12**
II	**Protein metabolism:** Classification of protein, Review of digestion and absorption. Deamination, transamination, trans-deamination, decarboxyalation, deamidation, Urea cycle, inborn errors of amino acid metabolism.	**12**
III	**Nucleic acid metabolism**: Classification, Biological oxidation, Electron transport chain, nucleic acid metabolism, structure of DNA & RNA, genetic code, DNA replication, bio synthesis of protein.	**12**
IV	**Lipid metabolism**: Classification, Oxidation of fatty acid- α , β, & ω. Bio synthesis of fatty acid & TGL, Cholesterol synthesis & synthesis of bile acids & bile pigments, ketosis, ketone bodies, acidosis & fatty liver.	**12**
Total		**48**
Pedagogy: Lectures, Assignments, Seminars		

Text Books:

1. U.Sathyanarayana and U.Chakrabani, Biochemistry, Third Edition, Uppala- Author Publishers, 2007.
2. Mahtab. S.Bamji, Kamala Krishnaswamy and G.N.V Brahmam, Text Book of Human Nutrition, Oxford and IBH Publishing Company, Third Edition.2009

Reference Books:

1. Deb. A.C., Fundamental of Biochemistry, New Centruy Book Agency (P) Ltd, Reprint 2004.
2. Srilakshmi.B; Nutrition Science, 15thedition, New Age International (P) Limited, Publishers, 2016.
3. Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I 2ndedition. The Bangalore Printing and Publishing Co., LTD, Reprint 2015.

Subject Name: Human Nutrition	**Scheme of Evaluation: (T)**
Subject Code: NDC154C103	**Credit Units: 3-1-0-4**

Course Objective:

To understand the functions, sources deficiency and excess of macro & micronutrients

Course outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the functions of different nutrients and health benefits	**BT 1**
CO 2	**Understand** the effect of various deficiency diseases and excess on health status	**BT 2**
CO 3	**Apply** knowledge in nutritional planning using different food sources	**BT 3**
CO 4	**Analyse** the role of different food constituents in protecting human health	**BT 4**
CO 5	**Evaluate** the quality of foods in relation to human health	**BT 5**

Detailed Syllabus:

Modules	Topics / Course content	Periods
I	**Carbohydrates** – Introduction, Classification - Basis of degree of polymerization, based on digestive fate of carbohydrates. Functions, Food sources, Requirements. Digestion, absorption and metabolic utilization of carbohydrates, Regulation of blood glucose concentration. Glycemic index -Factors affecting GI of foods. **Dietary fibre**-Introduction, Types, Properties, RDA and Components of dietary fibre. Role of fibre in human nutrition.	**12**
II	**Lipid**-Introduction, Classification, Function, Food sources, Requirements, RDA, digestion, absorption, transport and storage. Lipids and gene expression. Dietary fat and coronary heart disease. Fatty acid- Types, Functions, Requirements, food sources and deficiency. **Omega fatty acids** – Classification, role in good health, daily values, food sources, fortification of omega fatty acids. **Proteins-** Introduction, Classification, Functions, Requirements and RDA, Food sources, Digestion, absorption and metabolic utilization of protein, Quality of proteins. **Amino acid** - Types, functions, food sources, requirements, deficiency. Therapeutic applications of specific amino acids. Peptides of physiological significance. Proteins, amino acids and gene expression.	**12**
III	**Energy** – Introduction, Units, determination of energy value of food, physiological fuel value, Benedict's Oxy-calorimeter, relation between oxygen required and calorimeter value. Basal Metabolic rate – Introduction, measurement of basal metabolism determination of basal metabolic rate by calculation energy requirement, during work, Thermic effect of food, Total energy requirement – Meaning, Measuring total energy requirement. Factors affecting physical activity, basal metabolic rate and thermic effect of food, Dietary source, RDA.	**12**

IV	**Fat soluble Vitamins:** Introduction, functions, digestion, absorption, transport, storage, bioavailability, requirements, food sources, deficiency and toxicity. Interactions with other nutrients. **Water soluble Vitamins :**Thiamin, Riboflavin, Niacin, Pyridoxine, Folic acid, Vitamin- B12, Biotin, Pantothenic acid, Vitamin-C- Introduction, functions, absorption, transport, storage, bioavailability, requirements, food **Major minerals:** Calcium, Phosphorus and Magnesium - Introduction, functions, absorption, transport, storage, bioavailability, requirements, food sources, deficiency and toxicity. Interactions with other nutrients. **Electrolytes**: Sodium, Potassium and Chloride- Sources, functions, deficiency and toxicity.**Trace Minerals:** Iron, Copper, Fluride, Selenium, Manganese, Zinc, Iodine-Introduction, functions, absorption, transport, storage, bioavailability, requirements, food sources, deficiency and toxicity. Interactions with other nutrients.Sources, deficiency and toxicity. Interactions with other nutrients.	**12**
Total		**48**
Pedagogy: Lectures, Assignments, Seminars		

Textbooks:

1. Michael. J. Gibney etal; Clinical Nutrition Black well Science, 2005.
2. Shubhangini. A. Joshi; Nutrition and Dietetics, 3rd edition, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I and 11 2nd Edition, The Bangalore printing and publishing co., LTD, Reprint 2015.

2. SunetraRoday; Food Science and Nutrition, 2nd edition, Oxford University press, 2013.

3. Carol Byrd – Bredbenner; Wardlaw's perspectives in Nutrition, 9th edition McGraw – Hill International Edition, 2013.

Subject Name: Practical I : Laboratory Analytical Techniques	**Scheme of Evaluation: (P)**
Subject Code: NDC154C114	**Credit Units: 0-0-8-4**

Course Objective:

The course is designed with an objective to give the students a practical skills required to work in an analytical laboratory.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the practical skills associated with handling different apparatus used in chemical analysis	**BT 1**
CO 2	**Understand** the basic principles, biochemical reactions and processes	**BT 2**
CO 3	**Apply** the knowledge gained during the course in the field of research and development.	**BT 3**
CO 4	**Analyse** theoretical knowledge in developing practical solutions to determine food constituents	**BT 4**
CO 5	**Create** an understanding in expanding the future prospects of pursuing as analysts in laboratory	**BT 5**

Detailed Syllabus:

Modules	Topics / Course content	Periods
I	Familiarising with basic instruments/equipment used in biochemical laboratories. Safety measures to be followed while working in biochemical laboratory. Basic calculations of preparing buffer solutions, normal solutions, molar solutions, percent solutions etc. Qualitative tests for monosaccharides, disaccharides, polysaccharides, reducing & non-reducing sugars	**24**
II	Analysis of blood/urine parameters such as glucose, serum parameters, haemoglobin (cyanmethaemoglobin) , cholesterol, creatinine. Estimation of vitamin c, iron by titrimetric method/colorimetric method. Basics of chromate graphic methods.	**24**
III	Proximate composition of foods and products: Estimations of moisture, total minerals, fibre. fat, protein, carbohydrate and energy	**24**
IV	Estimations of selected vitamins and minerals, bioactive compounds in terms of phenols, flavonoids, anti oxidant capacity	**24**
Total		**96**
Pedagogy: Lectures, Experiments, Laboratory sessions		

Texts books:

1) A Manual of Laboratory Techniques. Eds. N. Raghuramulu, K Madhavan Nair, S Kalyansundaram, 1983.National Institute of Nutrition, ICMA, Hyderabad,
2) S. Ranganna (2011) Handbook of Analysis and Quality Control for Fruits & Vegetable Products. Tata McGraw - Hill Publishing Company Ltd. New Delhi.

Reference book :

1) Y. Pomeranz, C.E Meloan (2000) Food Analysis Theory & Practice. Springer

Subject Name: DSE – 1 (Food Science)	**Scheme of Evaluation: (T)**
Subject Code: NDC154D101	**Credit Units: 3-1-0-4**

Course Objective: The course is designed with an objective to give students knowledge on the science behind different food groups & also to learn about the effects of processing in nutritional composition of different foods.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the significance and functions of foods from different food groups and their various types ,compositions of materials and their usage for different food products	**BT 1**
CO 2	**Understand** the physical & chemical properties of foods and changes that occur due to processing.	**BT 2**
CO 3	**Apply** knowledge about the functions of foods in product development	**BT 3**
CO 4	**Analyse** the factors affecting the functional & structural changes of foods due to processing	**BT 4**
CO 5	**Evaluate** the quality of foods before and after processing	**BT 5**

Detailed Syllabus:

Modules	**Topics / Course content**	**Periods**
I	Definition of Food Science, Food, **Colloids** – Types and Properties; Sols – Properties; Gels – Properties and factors influencing gel formation; Emulsion – Types, formation, properties and stability of emulsions; Foams – formation, Stability and anti-foaming agents. **Cereals:** General structure, composition, Nutritive value of rice, wheat, maize, oats and jowar. Cereal cookery: Cereal protein- Gluten formation and factors affecting; Cereal starch, effect of moist heat – Gelatinisation, factors affecting gelatinisation Changes in cooked starches- Gel formation, Retrogradation and syneresis; Effect of dry heat- Dextrinisation; Effect of cooking on nutritive value.**Millets:** Composition, Nutritive value and uses of pearl millet, finger millet, proso millet.	**12**
II	**Pluses:** Composition and nutritive value, Digestibility of pulses and factors affecting the digestibility of pulse proteins, Toxic constituents in pulses and their elimination; commonly used pulses. Pulse cookery: Effect of cooking, Factors affecting cooking quality.**Nuts and Oilseeds:** Classification, composition and nutritive value, toxins present in nuts, role in cookery. Fats and oils: Nutritional importance of fats and oils, functions of oils and fats in foods, flavour changes – Rancidity – types and prevention, reversion.	**12**

III	**Milk and Milk products:** Composition of milk, Nutritive value of milk and milk products, Physical and chemical properties of milk, Types of milk available in the market.Meat: Classes of meat, structure, composition and nutritive value; post-mortem changes in meat, ageing, tenderising, curing; cuts and grades of meat. Meat cookery: Factors affecting cooking quality, changes in meat on cooking, tenderness and juiciness of meat. **Fish:** Classification, composition and nutritive value, selection. Fish cookery: Principles and methods. **Poultry:** Classification, composition and nutritive value, processing and cooking. **Egg:** Structure, composition and nutritive value, quality of egg – factors determining and evaluation. Egg cookery: Effect of cooking on nutritive value, effect of heat on egg protein, factors affecting coagulation of egg proteins, effect of other ingredients on egg proteins.	**12**
IV	**Vegetables:** Classification, composition and nutritive value, pigments, organic acids, enzymes, flavour compounds, bitter compounds, selection of vegetables. Vegetables cookery: Changes during cooking, loss of nutrients during cooking, effect of cooking on pigments. **Fruits:** Classification, composition and nutritive value, pigments, cellulose and pectic substances, changes during cooking, flavour constituents, polyphenols, bitterness, post-harvest changes and ripening. Browning: Types and prevention **Sugar:** Sources, properties, types, forms, liquid sweeteners, reactions of sugar Crystallisation: Factors affecting, role of sugar in cookery, stages of sugar cookery, crystalline and non-crystalline candies. **Spices:** Classification, general functions, commonly used spices and herbs, role of spices in cookery.	**12**
Total		**48**
Pedagogy: Lectures, Assignments, Seminars		

Text Books:

1. Srilakshmi. B; Food Science, 6th edition New Age International (p) Limited Publishers 2015.
2. Shakunthalamanay N; Shadakshara swamy. M; Foods Facts and Principles, Third edition, New Age International (p) Limited Publishers, 2014.

Reference Books:

1.Arindam Ramaswamy, Elements of Food Science, Oxford book company, 2010.

2.Norman N. Potter, Joseph H. Hotehkiss, and food science, fifth edition, CBS publishers and distributors, 1996.

Subject Name: DSE : Food Microbiology	**Scheme of Evaluation: (T)**
Subject Code: FTC154D102	**Credit Units: 3-1-0-4**

Course Objective: The course is designed with an objective to give students knowledge on the science behind different food groups & also to learn about the effects of processing in nutritional composition of different foods.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the significance and functions of foods from different food groups and their various types ,compositions of materials and their usage for different food products	**BT 1**
CO 2	**Understand** the physical & chemical properties of foods and changes that occur due to processing.	**BT 2**
CO 3	**Apply** knowledge about the functions of foods in product development	**BT 3**
CO 4	**Analyse** the factors affecting the functional & structural changes of foods due to processing	**BT 4**
CO 5	**Evaluate** the quality of foods before and after processing	**BT 5**

Detailed Syllabus:

Modules	Topics / Course content	Periods
I	**Food and Microorganisms**- food as a substrate for microorganisms, important microorganisms in food microbiology, general principles underlying food spoilage	**12**
II	**Food Contamination**- contamination, preservation and spoilage of cereal products/ vegetables and fruits/ meat and meat products/ milk and milk products/ canned products	**12**
III	**Principles of Food Preservation-** asepsis, removal, anaerobic condition, preservation by high temperature/ low temperature/ drying/ food additives/ radiation. **Foods and Enzymes Produced by Microorganism**s- productions of cultures, food fermentation, foods and enzymes from microorganisms.	**12**
IV	**Foods in Relation to Disease-** bacterial food borne illnesses, non-bacterial food poisoning/ infections/ intoxication, food borne disease outbreaks . **Food Sanitation, control and Inspection**- sterilization, microbiology in food sanitation, enforcement and control agencies-national/ international/ federal/ state/ private, microbiological criteria for food.	**12**
Total		**48**
Pedagogy: Lectures, Assignments, Seminars		

Text Books:

Frazier, W.C, Food Microbiology, McGraw Hill Publications, New York, 4th Edition, 1998.

Reference Books:

Matthews, K. R., Kniel, K. E., Montville, T. J., Food Microbiology: An Introduction, 2nd Ed., 2008.

SYLLABUS (2nd SEMESTER)

Subject Name: Physiological Aspects of Nutrition	**Scheme of Evaluation: (T)**
Subject Code: NDC154C201	**Credit Units: 3-1-0-4**

Course Objective:

The course aims to give an advance knowledge to the students on human physiology and understanding the integrated functions of all systems and the grounding of nutritionalscience in physiology.

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the human physiological systems	**BT 1**
CO 2	**Understand** the structures and functions of the of human physiological system	**BT 2**
CO 3	**Apply** the knowledge gained in physiology to nutrition and health	**BT 3**
CO 4	**Analyse** the role of the different parts of the systems and also the role of enzymes and hormones	**BT 4**
CO 5	**Evaluate** the relation between physiology and nutrition	**BT 5**

Detailed Syllabus:

Modules	**Topics / Course content**	**Periods**
I	**Digestive system**: Structure and functions of gastrointestinal tract and gastrointestinal secretions. Role of enzymes in digestion and role of prebiotics and probiotics in the maintenance of health of digestive system. Regulation of food intake –hunger, appetite and satiety. Liver: Structure and functions of liver.	**12**
II	**Respiratory system:** Structure of lungs and gaseous exchange (transport of oxygen and carbon-di-oxide). **Nervous system:** Structure and functions of brain (briefly) and spinal cord; structure and functions of neuron; conduction of nerve impulse, role of neuro transmitters; blood brain barriers, CSF, hypothalamus and its role in various body functions. Musculo skeletal system: Structure and functions of bone; physiology of muscle contraction. **Cardio vascular system:** Blood composition and functions, structure and function of heart and blood vessels, regulation of cardiac output and blood pressure, heart failure and hypertension. Excretory system: Structure and functions of kidney, structure of nephron, physiology of urine formation, micturition.	**12**

III	**Endocrine system:** Structure, function, role of hormones, regulation of hormone secretion and disorders – pituitary, thyroid, adrenal, pancreas and parathyroid glands. Functions and deficiency of insulin.	**12**
IV	**Reproductive system:** Ovaries- Structure of ovaries, functions of oestrogens and progesterone. Function of Uterus, Hormonal control of menstrual cycle, physiological changes in pregnancy, parturition, lactation and menopause. Testes: Structure of Testes, functions of testosterone, deficiency of testosterone.	**12**
Total		**48**
Pedagogy: Lectures, Assignments, Seminars		

Text Books:

1. Ganongs. W.F; Review of medical physiology, 1985.
2. Campbell. E.J et al; Clinical and applied physiology,1984.

Reference Books:

1. Guyton AC and Hall JB; Textbook of medical physiology, 1996.
2. Guyton AC; Functions of human body, 1985.

Subject Name: Research Methodology and Statistics	**Scheme of Evaluation:(T)**
Subject Code: NDC154C202	**Credit Units: 3-1-0-4**

Course Objective: The course aims to give a holistic knowledge with the principles and methods of scientific research and to familiarize students with statistical methods for data analysis

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the steps and sampling methods of research design and various methods of data design.	**BT 1**
CO 2	**Understand** the graphical representation of research methods and scientific report writing	**BT 2**
CO 3	**Apply** knowledge about probability and distribution factors.	**BT 3**
CO 4	**Analyse** the measures of central tendency (mean, mode)for grouped and ungrouped data.	**BT 4**
CO 5	**Evaluate** the measures of sigma scores, standard scores ,percentiles and calculation and interpretation of statistical procedures.	**BT 5**

Detailed Syllabus:

Modules	Topics / Course content	Periods
I	**INTRODUCTION TO RESEARCH** :Significance, Purpose and Types of Research , Ethics in Research, Plagiarism , Research Design – steps ,Sampling Methods and Scaling Techniques , Research Tools and Methodology of Data Collection , Databases in Food Research	**12**
II	**RESEARCH DATA PRESENTATION** : Variables in Research and Scales of Measurement , Tabulation of Research Data ,Graphical Presentation of Data – use of Excel and Statistical Software , Scientific Report Writing	**12**
III	**RELATED RESEARCH CONCEPTS :**Probability – Theoretical and Conditional ,Gaussian Curve ,Binomial Distribution , Poisson Distribution , Density Functions , Vital Statistics and Life Tables	**12**
IV	**DESCRIPTIVE STATISTICS** :Measures of Central Tendency – Mean, Mode, and Mode for Grouped and Ungrouped Data ,Measures of Variability – Range, Variance, Standard Deviation and Standard Error , Measures of Relative Positions - Sigma Scores, Standard Scores, Percentiles, Percentile Ranks , Measures of Relationships – Correlation and Regression Analysis , Measures of Shape – Skewness, Kurtosis , Calculations and Interpretation of Statistical Procedures	**12**
Total		**48**
Pedagogy: Lectures, Assignments, Seminars		

Text Books:

1. Jackson SL. 2012. Research Methods and Statistics: A Critical Thinking Approach. Fourth Edition. Wadsworth Cengage Learning.
2. Krishnan V. Statistics for Beginners. Atlantic Publishers and Distributors (P) Ltd

Reference Books:

1. Shabbir S. Food Borne Diseases. Humana Press.
2. Stephen AM. (Ed.). Food Polysaccharides and Their Applications. Marcel Dekker.

Subject Name: Therapeutic Nutrition I	**Scheme of Evaluation: (T)**
Subject Code: NDC154C103	**Credit Units: 3-1-0-4**

Course Objective:

To understand the etiology, physiological, metabolic anomalies, nutritional management of acute and chronic disorders / diseases

Course outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the factors to consider in dietary management in certain diseased conditions	**BT 1**
CO 2	**Understand** the effect of various disorders / diseases on nutritional status, nutritional and dietary requirements	**BT 2**
CO 3	**Apply** knowledge in dietary management through dietary modification and adaptations in diseases state.	**BT 3**
CO 4	**Analyse** the different diet related situations in diseased conditions.	**BT 4**
CO 5	**Evaluate** the various disorders / diseases on nutritional status, and their dietary & nutritional	**BT 5**

Detailed Syllabus:

Modules	Topics / Course content	Periods
I	**Introduction to medical nutrition therapy**- Introduction, Role of dietician in health care. **Nutrition care process:** Nutritional Assessment, Nutritional Diagnosis, Nutritional Intervention, Nutritional Monitoring and Evaluation.	**12**
II	**Patient Care and Counseling**. **Adaptation of therapeutic diets:**Introduction to therapeutic diets, Types of dietary adaptation for therapeutic needs,Normal nutrition- a base of therapeutic diet, Diet prescription and constructing therapeutic diets **Routine Hospital Diets:** Normal or general diets, Liquid diets, soft diets. **Mode of Feeding:** Oral feeding, tube or enteral feeding, Peripheral vein feeding, Total parenteral nutrition.	**12**
III	**Nutritional care in weight management:** Introduction, underweight, overweight and obesity.**Nutritional management in infections and fever:**Typhoid, Pneumonia and Tuberculosis.**Nutritional management in food allergies and food intolerance.**	**12**
IV	**Nutritional management in gastro intestinal diseases:** Diarrhoea, 10 Constipation, Gastritis, Peptic Ulcer. **Malabsorption Syndrome**- Celiac disease, Steatorrhoea, Lactose Intolerance, Tropical spruce, Crohns disease, Irritable bowel disease.	**12**
Total		**48**
Pedagogy: Lectures, Assignments, Seminars		

Text Books:

1. Michael. J. Gibney *et al;* Clinical Nutrition Blackwell Science, 2005.

2. Shubhangini. A. Joshi; Nutrition and Dietetics, 3rd edition, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I and 11 2nd Edition, The Bangalore printing and publishing co., LTD, Reprint 2015.

2. SunetraRoday; Food Science and Nutrition, 2nd edition, Oxford University press, 2013.

3. Carol Byrd – Bredbenner; Wardlaw's perspectives in Nutrition, 9th edition McGraw – Hill International Edition, 2013.

Subject Name: Practical II : Normal and Therapeutic Diets	**Scheme of Evaluation: (P)**
Subject Code: NDC154C214	**Credit Units: 0-0-8-4**

Course Objective:

The course is designed with an objective to give the students a practical knowledge on planning diet in different health conditions

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the methodological details to plan meals in different conditions	**BT 1**
CO 2	**Understand** the methods involved in planning modified diet in different health conditions	**BT 2**
CO 3	**Apply** the knowledge on nutrient compositions of foods in diet planning in normal and diseased conditions.	**BT 3**
CO 4	**Analyse** the compositional variations in foods to apply in meal planning	**BT 4**
CO 5	**Evaluate** the variations in meal planning as per the state of health	**BT 5**

Detailed Syllabus:

Modules	**Topics / Course content**	**Periods**
I	**Introduction to medical nutrition therapy-** Introduction, Role of dietician in health care. **Nutrition care process:** Nutritional Assessment, Nutritional Diagnosis,Nutritional Intervention, Nutritional Monitoring and Evaluation. **Patient Care and Counseling**.	**24**
II	**Adaptation of therapeutic diets:**Introduction to therapeutic diets, Types of dietary adaptation for therapeutic needs, Normal nutrition- a base of therapeutic diet, Diet prescription and constructing therapeutic diets **Routine Hospital Diets:** Normal or general diets, Liquid diets, soft diets. **Mode of Feeding:** Oral feeding, tube or enteral feeding, Peripheral vein feeding, Total parenteral nutrition.	**24**
III	**Nutritional care in weight management:** Introduction, underweight, overweight and obesity **Nutritional management in infections and fever:**Typhoid, Pneumonia and Tuberculosis. **Nutritional management in food allergies and food**	**24**

	intolerance.	
IV	**Nutritional management in cardiovascular diseases:** Dyslipidemia, Atherosclerosis, Hypertension, Myocardial Infarction, Angina Pectoris, Chronic Heart Failure, Rheumatic heart disease, Stroke. **Nutritional management in gastro intestinal diseases:** Diarrhoea, 10Constipation, Gastritis, Peptic Ulcer. **Malabsorption Syndrome**- Celiac disease, Steatorrhoea, Lactose Intolerance, Tropical spruce, Crohns disease, Irritable bowel disease.	**24**
		64
Pedagogy: Lectures, Experiments, Laboratory sessions		

Text books:

1. **Joshi, S.A., Nutrition and Dietetics,** Tata McGraw Hill Publications, New Delhi, 2004. **2. Srilakshmi B.,** Dietetics, New Age International (P) limited Publications, 2004
2. Amy E. Galena, Msh Rd. 2013. Eat to Your Good Health: Exchange Lists and Meal Planning for Eating Disorders. USA

Reference books:

1. Peggy S. Stanfield, Peggy Stanfield, Y. H. Hui. 2010. Nutrition and Diet Therapy: Self-Instructional Approaches. 5th edition. Jones and Bartlett publishers. Canada.
2. B Srilakshmi. 2014. Dietetics. New Age International publishers.

Subject Name: DSE II Food Processing & Preservation	**Scheme of Evaluation:(T)**
Subject Code: NDC154D201	**Credit Units: 3-1-0-4**

Course objectives: The course is designed to acquaint students with different types of processing techniques commonly used to process fruits and vegetables to make it consumable

Course outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the types, varieties, classification process of foods and their by-products utilizations	**BT 1**
CO 2	**Understand** the classification and composition of foods	**BT 2**
CO 3	**Apply** knowledge about food processing to formulate products/new products	**BT 3**

CO 4	**Analyse** the classification of minor and major fruits, lesser known fruits and vegetables and its nutritional importance.	**BT 4**
CO 5	**Evaluate** the market scenario of different food products.	**BT 5**

Detailed syllabus:

Modules	Topics / Course content	Periods
I	**Scope of food processing** in India with National and International perspectives, Food deterioration and control, Principles of food processing and preservation. Cereal technology: Rice- Milling, parboiling: Methods, advantages and disadvantages, byproducts of rice milling and their utilization. Wheat: Milling process, byproducts of wheat milling. Millets: Milling of major and minor millets. Manufacturing of breakfast cereals: Extruded products, puffing, flaking. **Pulse technology:** Milling of soya bean and Bengal gram and their byproducts, germination, fermentation, parching, popping, processed soya products. Nuts and oil seeds processing: Milling, techniques in extraction of oil, byproducts- Meal concentrates, isolate. Speciality fats, hydrogenation, production of MCT. Fat replaces and their uses.	**12**
II	**Dairy technology:** Milk processing: Seperation, standardization, pasteurization, homogenization, sterilization, evaporation, drying, membrane fractionation. Manufacturing of cheese, butter, khoa, yoghurt, srikhand, ice cream, condensed milk and dry milk. Milk substitutes- Lactone, infant formula. Byproducts: Skimmed milk, lassi, butter milk, whey, ghee residue. **Fruits and vegetable technology:** Dehydration, juice concentrate, canning of fruits and vegetables. Potato processing and its products (wafers and French fries). Fleshy food technology: Processing of fish for smoking, canning and freezing. Curing of meat, Poultry processing, Pasteurization of egg, manufacture of egg powder and frozen egg products.	**12**
III	**Preservation by use of High temperatures-** Factors affecting heat resistance, heat resistance of microorganism and their spores, determination of heat resistance, thermal-death-time curves,12D concept, heat penetration, determination of thermal processes, heat treatments employed in processing foods. **Preservation by use of low temperatures-** Low-temperature methods-Refrigeration, cool storage and freezing. Low- temperature-Microbial activity, characteristics, factors affecting the quality of foods and packaging requirements for foods.	**12**
IV	**Preservation by drying and dehydration-** Methods, advantages and disadvantages. Factors in the control of drying, treatments of food before drying, procedures after drying, microbiology of dried foods. **Food irradiation-** Introduction, electromagnetic energy, ionizing radiation, kinds of ionizing radiation and their applicability on food processing, mode of action, potentialities for radiation processing of foods, effects of food irradiation, safety of irradiated foods.	**12**
Total		**48**

Text Books:

1. Srilakshmi. B; Food Science, 6th edition, New Age International (P) Limited Publishers, 2015.

2. ShakunthalaManay. N; ShadaksharaSwamy.M; Foods Facts and Principles, 3rd edition, New Age International (P) Limited Publishers, 2014.

3. .Lillian Hoagland Meyer, Food chemistry, CBS Publishers and Distributors, 2004.

4. Subbulakshmi. G and Shobha. A.U; Food processing and preservation, New Age International (P) Limited Publishers, 2014.

Reference books:

1.Norman. N Potter, Joseph H. Hotchkiss, Food Science, 5th edition, CBS Publishers and Distributors, 1996.

2.Sivasankar. B; Food Processing and Preservation, PHI Learning Private Limited, 2011.

Subject Name: DSE II Sensory evaluation	**Scheme of Evaluation: (T)**
Subject Code: NDC154D201	**Credit Units: 3-1-0-4**

Course objectives: The course is designed to acquaint students with different types sense organs and sensory evaluation methods**.**

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the principles of sensory evaluation	**BT 1**
CO 2	**Understand** the science behind sensory evaluation	**BT 2**
CO 3	**Apply** knowledge of sensory evaluation in determining the quality of foods/new products	**BT 3**
CO 4	**Analyse**the diffrences in sensory parameters	**BT 4**
CO 5	**Evaluate**the products for different sensory characteistics	**BT 5**

Detailed syllabus:

Modules	**Topics / Course content**	**Periods**
I	Introduction to sensory evaluation, definitions. Basic tastes, human sense organs- anatomy-physiology, sensory perception, threshold,	**12**
II	Arrangements for sensory evaluation: Enviroment of test room. Designing a sensory evaluation laboratory.Product control. Sample preparatons and presentation. Panelists and their characteristics, panel selection. Factors influencing measurements; psychological and physiological factors.	**12**

III	Classifications of test methods, discrimination tests: paired comparison, duo-trio and triangle test. Qualitative test: interview and focus group.Ranking test, hedonic scale	**12**
IV	Subjective and objective test methods: Texture analyser- mechanical characteristics- chewiness, brittleness. Electronic tongue, electronic nose, eye. Hunter Lab colour analyser.	**12**
Total		**48**

Text Books:

1.Srilakshmi. B; Food Science, 6thedition, New Age International (P) Limited Publishers, 2015.
2. Brich G; Brennan J., & Parker K.J.(1977) " Sensory Properties of Foods " applied Science Publisher

Reference books:

1. Charley H., 'Food Science'; Mcmillan Publishing Company.
2. Lawlers H.T., &Heymann . 'Evalution of food principle & Practice'. Chapman & Hall.
3. Mahony M., Sensory Evaluation of food, Statistical methods & procedure.

SYLLABUS (3rd SEMESTER)

Subject Name: Community and Public Health Nutrition	**Scheme of Evaluation: (T)**
Subject Code: NDC154C301	**Credit Units: 2-1-0-3**

Course objectives: The course is designed to acquaint students with understanding of nutrition and health in community and public health sectors and learn about the importance of child and maternal health.

Course outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the types, varieties, classification process of assessment of health in community and public areas.	**BT 1**
CO 2	**Understand** the different aspects of community health	**BT 2**
CO 3	**Apply the** knowledge of nutrition science to human health across a life span.	**BT 3**
CO 4	**Analyse** the nutritional parameters for healthy lifestyle in communities.	**BT 4**
CO 5	**Evaluate** the importance of health programmes, policies related to maternal and child health.	**BT 5**

Detailed syllabus:

Modules	**Topics / Course content**	**Periods**
I	**Concept of Public Health Nutrition:** Understanding the terms, nutrition, health, healthcare, Role of public health nutrition in community, Public health nutrition- multidisciplinary concept **Nutritional problems: Protein Energy Malnutrition (PEM)-** Prevalence, causes, consequences, threat and prevention, Micronutrient deficiencies: vitamin A, iron, iodine, zinc, Other important vitamin deficiencies: Flourosis, lathyrism, etc.	**12**
II	**Economics of food security:** Methods of nutritional assessment (Direct and Indirect methods), Anthropometric assessment, Biochemical assessment, Clinical assessment, Dietary assessment	**12**
III	**Nutrition monitoring and surveillance:** Objectives and components, Recent programmes, Nutrition surveillance system, Nutrition policies and programmes, National nutrition programmes (ICDS), Supplementary feeding programmes, nutrition deficiency control programmes, food security programmes	**12**
IV	**Strategies to combat public health nutrition problems:** food based strategies, dietary diversification, food fortification, and nutrition and hea.th education. **Medical approach to combat public health nutrition problems:** immunization, implementation of nutritional education programmes,	**12**

	identifying the target audience, designing messages, choosing medium multimedia, development of communication strategy.	
Total		**48**

Text Books:

Wadhwa, Arvind Chadha, Ravindere Vijayaraghavan, ,k. Pandav, C.S. Sharema, Sushma kapil, Umesh Gopaldas, Tarra Mehan, Meenakshi kanani, Shubhada kapure, Deeksha, Text Book of Public Nutrition, IGNOU, New Delhi, 2013.

Reference books:

1. Suryatapa Das, Textbook of Community Nutrition, Four Edition, Academic Publisher
2. Seghal, 8 & Raghuvardhi, Textbook of Community Nutrition, Fourth Edition, Indian Council of Agriculture Research, Pusa, 2000.

Subject Name: Advances in Therapeutics Nutrition II	**Scheme of Evaluation: (T)**
Subject Code: NDC154C302	**Credit Units: 2-1-0-3**

Course Objective:

To understand the etiology, physiological, metabolic anomalies, nutritional management of acute and chronic disorders / diseases

Course outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the factors to consider in dietary management in certain diseased conditions	**BT 1**
CO 2	**Understand** the effect of various disorders / diseases on nutritional status, nutritional and dietary requirements	**BT 2**
CO 3	**Apply** knowledge in dietary management through dietary modification and adaptations in diseases state.	**BT 3**
CO 4	**Analyse** the different diet related situations in diseased conditions.	**BT 4**
CO 5	**Evaluate** the various disorders / diseases on nutritional status, and their dietary & nutritional	**BT 5**

Detailed syllabus:

Modules	**Topics / Course content**	**Periods**
I	**Introduction to non- communicable diseases:** Diabetes Mellitus, coronary heart diseases, renal diseases, cancer.	**09**

	Nutritional management in diabetes mellitus (DM): prevalence, classification and etiology, factors affecting normal blood sugar levels, metabolic aberrations and symptoms, diagnosis, complications, management of DM, exercise and drugs, education, prevention.	
II	**Nutritional management in coronary heart diseases (CHD):** prevalence, etiology: cardiovascular risk factors, pathophysiology of CHD**.** **Common disorders of CHD and their management:** dyslipidemia, atherosclerosis, hypertension, angina pectoris, myocardial infections, congestive cardiac failure, rheumatic heart disease. **Nutritional management in renal diseases (RD):** physiology of kidney, assessment of kidney function, common renal diseases. **Common disorders of RD and their management:** acute and chronic nephritis, nephrotic syndrome, acute renal failure, chronic renal failure, end stage renal disease, renal calculi, commonly available commercial enteral nutrition formulas for renal patients.	**09**
III	**Nutritional management in cancer:** development, characteristics and identification of cancer cells, etiological risk factors in cancer, metabolic alterations and the resultant nutritional problems, clinical manifestations associated with cancer, nutritional requirements of cancer patients, dietary management of cancer patients and feeding problems related cancer therapy, prevention. **Nutritional management in neurological disorders:** common neurological disorders, physiological aspects of the CNS, feeding and nutritional issues, dysphagia, alzheimers, Parkinson, epilepsy, neurotrauma, spinal trauma.	**09**
IV	**Nutrition in stress, burns and surgery:** introduction, nutritional requirement during stress, degree of burns (1^{st}, 2^{nd} and 3^{rd}), diet , nutritional assessment, complications, nutritional care of patients with burns, principles of diet therapy, accidental injury- nutritional care and nutrition needed, surgery- nutrients needed, post- operative diet. **Nutrient drug interaction:** introduction, nutrient and drug absorption, effect of drug on food intake, nutrient metabolism, precautions to be taken.	**09**
Total		**36**

Text Books:

1. Michael. J. Gibney etal; Clinical Nutrition Blackwell Science, 2005.

2. Shubhangini. A. Joshi; Nutrition and Dietetics, 3rd edition, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I and 11 2nd Edition, The Bangalore printing and publishing co., LTD, Reprint 2015.

2. SunetraRoday; Food Science and Nutrition, 2nd edition, Oxford University press, 2013.

3. Carol Byrd – Bredbenner; Wardlaw's perspectives in Nutrition, 9th edition McGraw – Hill International Edition, 2013.

Subject Name: Practical III: Nutritional Status and Advanced Therapeutic Diets

Scheme of Evaluation: (P)

Subject Code: NDC154C313 **Credit Units: 0-0-4-2**

Course Objective:

To understand the concept and importance of nutritional status and learn the methods and detailed processes used for assessment of the same.

Course outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the factors to consider in nutritional assessment in population.	**BT 1**
CO 2	**Understand** the effect of various disorders / diseases on nutritional status and dietary requirements	**BT 2**
CO 3	**Apply** knowledge in assessment of nutritional status in normal and disease conditions	**BT 3**
CO 4	**Analyse** the different diet related situations in diseased conditions.	**BT 4**
CO 5	**Evaluate** the various disorders / diseases on nutritional status, and their dietary management.	**BT 5**

Detailed syllabus:

Modules	**Topics / Course content**	**Periods**
I	**Anthropometric assessment:** Assessment of height, weight, BMI, Mid-upper arm circumference (MUAC), head circumference, waist- hip ratio.	**10**
II	**Biochemical assessment:** blood estimation- haemoglobin levels, blood sugar levels, Urine estimation- proteinuria, RE (routine estimation) **Clinical assessment:** clinical signs and symptoms of micronutrient deficiencies.	**20**
III	**Dietary assessment:** diet survey, 24- hour recall method, weighment method, dietary history, food frequency questionnaire.	**20**
IV	**Meal planning of different disease condition:** diabetes mellitus, coronary heart diseases, renal diseases, cancer, burns, post-operative conditions.	**14**
Total		**64**

Textbooks:

1. Srilakshmi. B; Dietetics, 7th edition, New Age International (P) Limited Publishers, 2014.

Reference books:

1. William's Nix, Basic Nutrition and Diet therapy, 14th edition, Published by Mosby, 2013.
2. MahtabS.Bamji, Prasad Rao, N. Vinodini Reddy; Textbook of Human Nutrition, Second Edition Oxford and IBH Publishing Co. Pvt Ltd, 2003.
3. Nutrient Requirement and Recommend Dietary Allowances for Indians by Indian council of Medical research, National Institute of nutrition, Hyderabad

Subject Name: Cereals, Pulses and Oilseeds Processing	**Scheme of Evaluation: (T)**
Subject Code: NDC154D301	**Credit Units: 3-1-0-4**

Course Objective:

The course is designed to appraise the students to teach technology of milling of various cereals, to impart technical knowledge on refining of oilseeds and to understand the basic composition and structure of cereals and legumes.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the nutritive value and distribution of various chemical constituents in rice grain	**BT 1**
CO 2	**Understand** the different principles, milling techniques and machineries used in wheat.	**BT 2**
CO 3	**Apply** knowledge in the industrial application of corn/maize and its products	**BT 3**
CO 4	**Analyse** on the processing methods and importance of millets in the treatment of lifestyle diseases	**BT 4**
CO 5	**Evaluate** the methods of studying quality of cereals with special reference to cooking quality	**BT 5**

Detailed Syllabus:

Modules	**Topics / Course content**	**Periods**
I	**RICE: General Introduction, rice production.** Rice structure, proximate Composition, Nutritive value and distribution of various chemical constituents in rice grain: Methods of studying quality of Rice with special reference to cooking quality: Changes during aging of rice, accelerated aging of rice. Methods of enrichment of rice with nutrients like vitamins and minerals Parboiling of rice. Principle process and Methods of parboiling, economical and nutritional advantages of parboiling. **Rice Milling operations;** cleaning and milling machinery, Degree of Milling, Milling effect on nutrition and quality of rice; SEM process of	**10**

	rice milling.	
II	**WHEAT:** General introduction, wheat production, wheat varieties, types and grades of Wheat. Nature of Wheat grain, structure, chemical composition and nutritive values. **Milling of wheat**-general principles and Machine operations. **Roller flour milling Operations:**-Principles and machinery operation including break system, reduction system, purification and Air fractionation of flours, etc.Flour and flour treatment; Utilization of by-products of wheat milling. **Dough Rheology:** Introduction, basic concepts to dough chemistry.	**12**
III	**PULSES:** Proximate Composition-Proteins, Carbohydrate, Lipids, Vitamins, and Minerals. Processing methods: Soaking, Germination, Decortication, Fermentation, Milling Anti-nutritional factors: Favism, Lathyrism etc. Products of processing: Grits, Nuggets, Isolates, Concentrates. Effect of processing on composition and nutritive Value. Fortification and Value-Addition of products. **OIL SEEDS:** Processing of oil seeds, refining of oil Processing of oil seed as vegetable protein isolates and concentrates and their uses Processing of oil seeds as vegetables milk like beverages.	**12**
IV	**CORN/MAIZE:** General introduction, Corn production, types and grades of Corn. Nature of grain, structure of grain, proximate composition and Nutritive value. Dry Milling of corn; general principles and machine operations. Wet milling operation of corn; general principles and machine operations Industrial applications of corn products- corn starch and com syrups. **MILLETS:** Types, nutritive value, value added products - Processing methods and importance in treatment of lifestyle diseases.	**14**
Total		**48**

Text books:

1. Manley DJR.1983. Technology of Biscuits, Crackers, and Cookies. Ellis Horwood.
2. Matz SA. 1992. Bakery Technology and Engineering. 3rd Ed. Chapman & Hall.

Reference books:

1. Dubey SC. 2002. Basic Baking. The Society of Indian Bakers, New Delhi.
2. Francis FJ. 2000. Wiley Encyclopaedia of Food Science & Technology. John Wiley & Sons.
3. Pyler EJ. Bakery Science & Technology. 3rd Ed. Vols. I, II. Sosland Publ.

Subject Name: Product Development	**Scheme of Evaluation: (T)**
Subject Code: NDC154D302	**Credit Units: 3-1-0-4**

Course Objective:

The course is designed to appraise the students to know about the concept of product development and to study about steps involved in development of new products and quality control of the products.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the important aspects for developing a new food product.	**BT 1**
CO 2	**Understand** the importance of quality control and food safety.	**BT 2**
CO 3	**Apply** knowledge in the development of novel nutrient dense food products	**BT 3**
CO 4	**Analyse** on the processing methods and packaging materials for food products.	**BT 4**
CO 5	**Evaluate** the techniques of food product development considering the quality and safety of the product.	**BT 5**

Detailed syllabus:

Modules	Topics / Course content	Periods
I	**Product development:** concept, introduction, need and market survey **New food product-** Definition.classification, factors shaping new product development: social concern, health concern, impact of market place influence and technology.	**10**
II	**Product development-** Steps, standardization methods. Portion size and portion control; Calculation of nutritive value and cost of production. Shelf life and storage. stability evaluation procedure.	**12**
III	**Product evaluation-** Development of score card and analysis of data. Selection and training of judges. **Packaging-**Suitability, development of packages and Labeling.	**12**
IV	**Quality control-**Objectives, importance, functions of quality control, stages ofquality control in food industry. Food quality assurance Design of company quality assurance program and microbiological concerns, Managing quality in supply chain and marketing of food products. **Government regulations in quality control:**FAO/WHO codex Alimentarius commission, PFA, AGMARK, BIS, FPO, fair average quality (FAQ) specification for food grains, ISO 9000 series. HACCP-Background, principles, benefits and limitation. **Consumer Protection Act (CPA)** **Food adulteration-**Common adulterants and tests to detect common adulterants.	**14**
Total		**48**

Text books:

Avantina Sharma, Textbook of Food Product Development, CBS Publisher and Distributors Pvt. Ltd.

Reference book:

Fuller, G.W. New food product development. Taylor and Francis, CRC Press, 2004

Subject Name: Nutraceuticals and Functional Foods	**Scheme of Evaluation: (T)**
Subject Code: NDC154D303	**Credit Units: 3-1-0-4**

Course Objective:

The course is designed to appraise the students to know about the importance of nutraceuticals and functional foods and their role in maintaining optimal health.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the components of functional foods and foods containing nutraceuticals	**BT 1**
CO 2	**Understand** the developments in the field of nutraceuticals and nutrigenomics.	**BT 2**
CO 3	**Apply** knowledge to improve the daily dietary intake by inclusion of functional foods in the diet.	**BT 3**
CO 4	**Analyse** the effects of nutrients in molecular level process in the body and the effect of phytochemcials in disease conditions.	**BT 4**
CO 5	**Evaluate** the importance of probiotics and prebiotics in human health	**BT 5**

Detailed syllabus:

Modules	**Topics / Course content**	**Periods**
I	**Nutraceuticals:** Definition, history, classification, market trends, sources. Demand drivers for health supplements and nutraceuticals in India. Development of nutraceuticals incorporated food products- Tailoring diets for special needs, critical steps, stability and bio availability of bio actives substances in food matrices.	**10**
II	**Functional foods:** Definition, history and types, Health benefits of functional foods and future promises in Indian diet. Future research and develop of functional foods- Qualified studies, modern technologies and appropriate consumer communication. Safety and Regulatory aspects of functional foods.	**12**

III	**Probiotics and Prebiotics:** Definition, types, source and Health benefits. Recent advances in probiotics and prebiotics. FAO/WHO Standards/ guidelines on probiotics and prebiotics.	**12**
IV	**Caroteniods:** beta carotene, lycopen and lutein sources and uses. **Terpenes:** terpenoids, saponin, tocotrials- sources and uses. Curcumin for prevention and treatment of chronic diseases- Introduction, mechanism of action of curcumin, role of curcumin in cancer, CVDs, neurological diseases, pulmonary diseases, diabetes, rheumatic diseases and infection diseases.	**14**
Total		**48**

Textbooks:

1.Dilip ghosh et al (2006). Clinical aspects of functional foods and nutraceuticals, CRC Press
2. Mahtab S Bamj, N Prahlad Rao, Vinodini Reddy (2005). Text book of Human Nutrition -, Second Edition, Oxford and IBH Publishing Co. Pvt.Ltd.

Reference books:

1. Wilman(2007). Hand book of Nutraceuticals and functional foods, second editin.CRC press.
2.Gibson GR and Williams CM (2000). Functional Foods - Concept to Product.

Subject Name: Sports Nutrition	**Scheme of Evaluation: (T)**
Subject Code: NDC154D304	**Credit Units: 3-1-0-4**

Course Objective:

The course is designed to appraise the students to know about the importance and role of nutrition and diet for athletes and sportsperson.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the components of nutrients and diet for sportsperson.	**BT 1**
CO 2	**Understand** the nutritional needs of athletes and plan diet for them	**BT 2**
CO 3	**Apply** knowledge to improve the health of athletes on the basis of their nutrient needs.	**BT 3**
CO 4	**Analyse** the effects of lifestyle disorders on performance in sports.	**BT 4**

CO 5	**Evaluate** the utilization and importance of exercise in stress and health management	**BT 5**

Detailed syllabus:

Modules	Topics / Course content	Periods
I	**Overview of nutrition for fitness and sports:** exercise for health, promotion of exercise, guidelines for human energy requirements for exercise, major human energy systems - Components of energy expenditure, fatigue during exercise. **Carbohydrates and exercise -** Role of CHO in energy systems during exercise, Dietary CHO recommendations and strategies for exercise performance.	**10**
II	**Fats and exercise:** Role of lipids in energy systems during exercise, Dietary fatrecommendations and strategies for exercise performance. **Protein and exercise-** Role of protein in energy systems during exercise, Dietary protein recommendations and strategies for exercise performance. Energy, Fluid, electrolytes, temperature regulation and exercise	**12**
III	**Nutrition for child, adolescent and master athletes:** Process of growth and development during childhood and adolescence, Factors influencing with special emphasis of exercise -Physiology of ageing and factors influencing; -Nutritional problems of younger and master athletes - Nutritional guidelines and Nutritional Requirements for younger and older athletes. Nutritional concerns of travelling and vegan athletes; Athletes performing under altered climatic conditions-High altitude, Mountaineers, High and low climatic temperature etc.	**12**
IV	**Nutritional Management of clinical conditions among sports -** Diabetes Mellitus Etiology, Pathophysiology, metabolic alterations, Complications, Assessment and Management. **-Hypertension and Heart disease -**Prevalence, Pathophysiology, Role of Macro & Micronutrients. **Planning and preparation of diets for team sports -**Cricket, Hockey, Football, Kabbadi and Basketball.	**14**
Total		**48**

Textbooks:

1. Slater, G., & Phillips, S. M. (2011). Nutrition guidelines for strength sports: sprinting, weightlifting, throwing events, and bodybuilding. Journal of sports sciences, 29(sup1), S67-S77.
2. Helms, E. R., Aragon, A. A., & Fitschen, P. J. (2014). Evidence-based recommendations for natural bodybuilding contest preparation: nutrition and supplementation. Journal of the International Society of Sports Nutrition, 11(1), 20.

Reference books:

1. Maughan, R. J., & Burke, L. M. (2012). Practical nutritional recommendations for the athlete. In Sports Nutrition: More Than Just Calories-Triggers for Adaptation (Vol. 69, pp. 131- 150). Karger Publishers.
2. Jeukendrup, A., & Gleeson, M. (2010). Sport nutrition: an introduction to energy production and performance (No. Ed. 2). Human Kinetics.

SYLLABUS (4thSEMESTER)

Subject Name: Institutional Food Service Management	**Scheme of Evaluation: (T)**
Subject Code: NDC154C401	**Credit Units: 2-1-0-3**

Course Objective:

Understand key concepts of creating, managing, and running a foodservice business, from concept to operation.

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the significance of food and beverage as it relates to the hospitality industry	**BT 1**
CO 2	**Understand** of work areas such as Receiving, storing, food preparation, and serving	**BT 2**
CO 3	**Apply** the basic knowledge about menu planning	**BT 3**
CO 4	**Analyse** the standard of recipes and standard portion sizes	**BT 4**
CO 5	**Evaluate** the personnel management and financial management**.**	**BT 5**

Detailed syllabus:

Modules	Topics / Course content	Periods
I	**Food service management-** Principles and functions **Food service organisation-** Development of food service institution, objectives and classification. **Classification of food service institutions according to** a. Function: Profit oriented, service. oriented and public health facility oriented b. Processing method: Conventional system, commissary system and fast. food service systems. c. Service of food:Self service, tray service and waiter-waitress service.	**09**
II	**Floor planning and layout-** Characteristics of typical food service facilities. Plan of work areas Receiving, storing, food preparation, cooking, serving, dining, dishwashing, pot and pan washing and garbage disposal: flow space relationship. Working heights and dimensions of work centers. **Equipment-** Catering equipment, selection equipment, equipment design, purchasing equipment and care and maintenance of equipment.	**09**
III	**Quantity food preparation-** Selection, purchasing methods and storage of foods. **Menu planning -** Definition, principles. involved in planning and types of menus.	**09**

	Standardization of recipe-Definition, standard recipe format and uses. Standard portion sizes Definition, portioning equipments and portion control.	
IV	**Financial management -** Costing and budgeting, pricing and accounting. **Personnel management-** Concepts, staff employment and employment benefits **Hospital food service -** Objectives and Classification. **Industrial food service-** Objectives and Cassification.	**09**
Total		**36**

Textbooks:

Sethi M., Catering Management, Institutional Food Management: An Integrated Approach, New Age International Ltd. Publishers, Third Edition, 2015.

Reference book:

Sethi M and Mahan 8 (Revised 2nd edition, 2007). Catering Management, An Integrated Approach. New Age Inderenational (P) Ltd.

Subject Name: Food Safety and Quality Control	**Scheme of Evaluation: (T)**
Subject Code: NDC154C402	**Credit Units: 2-1-0-3**

Course Objective:

Understand various areas of Food Safety & Quality Assurance.

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the risk factors of food contamination and food adulteration	**BT 1**
CO 2	**Understand** the concept of quality assurance, quality control and quality management	**BT 2**
CO 3	**Apply** the basic knowledge about food safety standards	**BT 3**
CO 4	**Analyse** hazard analysis critical control point(HACCP)	**BT 4**
CO 5	**Evaluate** sensory parameters through sensory evaluation**.**	**BT 5**

Detailed syllabus:

Modules	Topics / Course content	Periods
I	**Introduction to food safety:** Definition of food safety, food safety issues, factors affecting food safety. Safe food and importance of safe food **Food Contamination;** Types of food contamination, harmful effects and control. **Food adulteration:** Definition, common adulterated foods and harmful effects of adulterants **Risk analysis-** An introduction to risk analysis, risk assessment, risk management, risk communication	**09**
II	**Concepts of QC, QA & Quality Management** **Concept of quality:** Quality control and Quality assurance- Objectives, importance and functions. **Quality attributes-** physical, chemical, nutritional, microbial. **Total Quality Management.** **Pre-requisite programmes-** good hygienic practices, good manufacturing practices Hazard analysis critical control point: Definition, principles, development and application	**09**
III	**Global and domestic Food Safety Standards** ISO 22000:2005-Food safety management system ISO 9001:2000-Quality management system **Global scenario-** codex alimentarious commission (AC) **Domestic accrediatingorganisations:** FSSAI, AGMARK, BIS	**09**
IV	**Sensory Evaluation:** **Sensory analysis:** Introduction, general testing conditions, Requirements of sensory laboratory, factors influencing sensory measurements. Sensory quality parameters - selection of sensory panelists. **Sensory evaluation tests-** Subjective and objective test of sensory parameters. Flavor profile tests, statistical analysis of sensory data	**09**
Total		**36**

Textbooks:

1. Amerine MA, Pangborn RM & Rosslos EB. 1965. Principles of Sensory Evaluation of Food. Academic Press.
2. Early R.1995 Guide to Quality Management Systems for Food Industries, Blackie Academie.

Reference books:

1. Furia TE. 1980. Regulatory status of Direct Food Additives. CRC Press.
2. Jellinek G. 1985. Sensory Evaluation of Food- Theory and Practice. Ellis Horwood

Subject Name: Practical IV: Institutional Food Service Management and Food Safety

Scheme of Evaluation: (P)

Subject Code: NDC154C413 **Credit Units: 0-0-4-2**

Course Objective:

Understand key concepts of creating, managing, and running a foodservice business, from concept to operation.

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the significance of food and beverage as it relates to the hospitality industry	**BT 1**
CO 2	**Understand** of work areas such as Receiving, storing, food preparation, and serving	**BT 2**
CO 3	**Apply** the basic knowledge about menu planning	**BT 3**
CO 4	**Analyse** the standard of recipes and standard portion sizes	**BT 4**
CO 5	**Evaluate** the personnel management and financial management**.**	**BT 5**

Detailed syllabus:

Modules	Topics / Course content	Periods
I	**Quantity Cooking: Concept, Principles and Techniques** Learning weights, measures and recipe conversions. Survey to find out the prevailing prices of various food stuffs. Analysis of the relationship between purchase amount, edible portions and cooked weight of food stuffs.	**12**
II	**Planning and Organization of Meals for Institutional Feeding** Learning to plan and organize meals for university canteen, institutional mess **Planning and Organization for Industrial Catering** Planning meals for industrial workers (moderate and heavy workers) **Catering for Special Occasions and Events** Planning and organizing meals for a convention/ conference/ workshops/ exhibitions	**14**
III	**Preparing a Planning Prospectus for Setting up a Food Service Unit** Visit to a food service establishment to study its planning and functioning. Preparing a planning guide/ prospectus to set up a food service unit.	**12**
IV	**Analysis of food adulterants in different types of food groups** (cereals, pulses, spices and condiments, milk and milk products, etc) **Study of food safety and hygiene protocols** of food service organizations.	**10**

	Preparation of HACCP chart for a food service organization	
Total		**48**

Textbooks:

Sethi M., Catering Management, Institutional Food Management: An Integrated Approach, New Age International Ltd. Publishers, Third Edition, 2015.

Reference book:

Sethi M and Mahan 8 (Revised 2nd edition, 2007). Catering Management, An Integrated Approach. New Age Inderenational (P) Ltd.

Subject Name: Animal Product Processing and Utilization	**Scheme of Evaluation: (T)**
Subject Code: NDC154D401	**Credit Units: 3-1-0-4**

Course Objective:

Understand the processing methods and importance of animal product.

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the importance of meat, fish and egg in national economy	**BT 1**
CO 2	**Understand** the concept of quality of meat and its preservation	**BT 2**
CO 3	**Apply** the basic knowledge about inspection and grading of meat	**BT 3**
CO 4	**Analyse** the factor affecting egg quality during packaging of eggs.	**BT 4**
CO 5	**Evaluate** the microbiology of poultry meat, spoilage and its control.	**BT 5**

Detailed syllabus:

Modules	**Topics / Course content**	**Periods**
I	**Meat** Sources of meat and meat products in India, its importance in national economy. Chemical composition and microscopic structure of meat. Effect of feed, breed and management on meat production and quality. Stunning types and Slaughtering house operations of animals, inspection and grading of meat.	**10**
II	**Meat Processing**	**12**

	Factors affecting post-mortem changes. Factors affecting meat quality. Preservation of meat. Meat tenderization. Meat plant sanitation and safety. Modern abattoirs and design of facilities typical layout and features. Microbiology & storage of meat. Meat products and it's by-products. Byproduct utilization. Packaging of meat.	
III	**EGGS** Structure, composition, nutritive value and functional properties of eggs and its preservation by different methods. Processing of egg (egg powder manufacturing). Factor affecting egg quality and measures of egg quality. Packaging of eggs.	**12**
IV	**Fish** Types of fish, composition, structure, post-mortem changes in fish. Fish processing and preservation: Fish by-products - shrimp and its processing. Poultry industry in India. Classes of poultry meat. Processing of poultry. Commercial methods of slaughtering, dressing. Microbiology of poultry meat, spoilage and its control. Preservation methods of poultry meat. By products of poultry meat and packaging of poultry products.	**14**
Total		**48**

Text books:

1. Mead M. 2004. Poultry Meat Processing and Quality. Woodhead Publisher.
2. Pearson AM and Gillette TA. 1996. Processed Meat. 3rd edition, Chapman and Hall.

Reference Books:

1. Hui YH. 2001. Meat Science and Applications. Marcel Dekker
2. Kerry J. *et al.* 2002. Meat Processing. Woodhead Publ. CRC Press.

Subject Name: Food Packaging and Labeling	**Scheme of Evaluation: (T)**
Subject Code: NDC154D402	**Credit Units: 3-1-0-4**

Course Objective:

Understand the concept of packaging and labeling regulations and importance of their role in food industries.

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the types of packaging materials used for the food application	**BT 1**
CO 2	**Understand** the requirements of quality parameters for different packaging materials with respectto FSSAI Packaging regulation	**BT 2**

CO 3	**Apply** the basic knowledge about packaging system and methods	**BT 3**
CO 4	**Analyse**thePackaging material and their properties.	**BT 4**
CO 5	**Evaluate** the Packaging Design & Environmental Issues in Packaging**.**	**BT 5**

Detailed syllabus:

Modules	Topics / Course content	Periods
I	**Introduction to food packaging:** Packaging terminology definition Functions of food packaging, Packaging environment. Characteristics of food stuff that influences packaging selection.	**08**
II	**Packaging material and their properties:** Glass, Paper and paper board, Corrugated fibre board (CFB), Metal containers: Tin Plate and Aluminum, Composite containers, Collapsible tubes, Plastic Films, Laminations, Metalized films, Co extruded films, Testing of packaging material.	**12**
III	**Packaging Systems and methods:** Vacuum Packaging, Controlled atmospheric packaging, Modified atmospheric packaging, Aseptic Packaging, Retort processing, Microwave packaging, Active Packaging, intelligent packaging, ecofriendly Edible packaging. Shrink and stretch packaging.	**12**
IV	**Packaging of fresh and processed foods**: Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages. Dehydrated and frozen foods. Liquid and powder filling machines like aseptic system, form and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines. **Packaging Design & Environmental Issues in Packaging:** Food marketing and role of packaging- bar coding. Migration in food packaging. FSSAI regulations for packaging and food labeling.	**16**
Total		**48**

Textbooks:

1. Miquel Angelo PRC, Ricardo Nuno CP, Oscar Leandro DSR, Jose Antonio CT, Antonio Augusto V. 2016. Edible Food Packaging: Materials and Processing Technologies, CRC Press. Taylor & Francis Boca Raton, FL
2. Luciano P, Sara L,2016, Food Packaging Materials, Springer cham Heildelberg, New York, Department of Food Science and Technology

Reference Books:

1. Robertson, G.L. 2006 Food Packaging: Principles and Practice (2nd ed.), Taylor & Francis
2. Han, J.H. (Ed.) 2005 Innovations in Food Packaging, Elsevier Academic Press.
3. Coles, R., McDowell, D. and Kirwan, M.J. (Eds.) 2003 Food Packaging Technology, CRC Press

Subject Name: Diet Counseling	**Scheme of Evaluation: (T)**
Subject Code: NDC154D403	**Credit Units: 3-1-0-4**

Course Objective:

Understand the concept of Providing nutrition counseling and education to individuals

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the principles and process of councelling	**BT 1**
CO 2	**Understand** the counselling skills for dieticians	**BT 2**
CO 3	**Apply** the basic Principle of counselling for effective outcome	**BT 3**
CO 4	**Analyse** the role of counselling in hospital, community, health camps	**BT 4**
CO 5	**Evaluate** the different approaches to counselling	**BT 5**

Detailed syllabus:

Modules	**Topics / Course content**	**Periods**
I	**Counselling:** Introduction, definition and Importance. Types of counselling, advantage and disadvantage. Principle of counselling, the process of counselling, qualities of an effective counselling.	**08**
II	**Counselling skills for dietician:** Introduction, dietician using counselling skills, qualities of a dietician, developing a counselling approach, different approaches to counselling. **Diet counselling steps:** Assessment components, planning components, Implementation components and evaluation components.	**12**
III	**Role of counselling in hospital, Role of counselling in community, Organizing health camps -**hospital level and community level, Diet counselling for pregnancy, lactation and child care, Patient follow up/home visits.	**12**
IV	Diet counselling for adolescent, adults and old age. Diet counselling for obese people, Infectious diseases, and AIDS Diet counselling for Diabeties, CVD, Gastrointestinal diseases, liver diseases and cancer.	**16**
Total		**48**

Textbooks:

1. Gibson, R.L., Mitchell, M.H.(2005). Introduction to counselling and guidance (6th Ed).
2. 2. Judey gable, (2005). Counselling skills for dietitians, 2nd edition, black publishing.

Reference books:

1. WHO, (2014), NACS, A programme guide.
2. WHO, (2018). NACS, module 3 counselling guide.

Subject Name: Geriatric Nutrition	**Scheme of Evaluation: (T)**
Subject Code: NDC154D404	**Credit Units: 3-1-0-4**

Course Objective:

Understand the role, responsibility, behavior and nutrition requirement of geriatric population.

Course Outcome:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Remember** the psychological and physiological changes during aging	**BT 1**
CO 2	**Understand** the Functional manifestations of ageing	**BT 2**
CO 3	**Apply c**ommon molecular theories of ageing and nutritional interventions	**BT 3**
CO 4	**Analyse** the common diseases in elderly	**BT 4**
CO 5	**Evaluate** the Assessment of nutritional status in geriatric .	**BT 5**

Detailed syllabus:

Modules	**Topics / Course content**	**Periods**
I	**The Ageing Society-** Global and Indian scenario, epidemiology, life expectancy vs life Span, usual vs successful ageing, changes associated with Ageing process, cellular aspects of ageing. **Physiological changes:** body composition gastrointestinal, cardiac, respiratory, renal, muscular, skeletal, neural(including brain and spinal cord), endocrine and metabolic, changes and impact on health and nutritional status **Functional manifestations of ageing:** constipation, impaired fluid and electrolyte balance, altered thermoregulation, sleep disturbances	**08**
II	**Common molecular theories of ageing and nutritional interventions,** Factors influencing ageing endogenous and exogenous, benefits of calorie restriction and exercise. Nutritional requirements factors influencing and dietary plans for senior citizens	**12**

	Promoting successful ageing-traditional and modern methods	
III	**Nutritional and health status of elderly.** Factors influencing food, benefits of calorie restriction and exercise Nutritional requirements factors influencing and dietary plans for senior citizens Promoting successful ageing-traditional and modern methods Nutritional and health status of elderly. Factors influencing food consumption and nutritional status of elderly Undernutrition in the Elderly - risk factors. **Common diseases in elderly:**Etiopathogenesis, manifestations and interventions - Gastrointestinal disturbances, cardiac, renal, respiratory diseases, mental changes including depression, dementia, Parkinson's, Alzheimer's, bone and muscle related abnormalities, Sarcopenia, frailty Role of Nutrition in prevention of age related diseases, nutrient drug interactions	**12**
IV	Assessment of nutritional status mini nutrition index, assessment of frailty Policies and programmes of the government and NGO sector pertaining to the elderly Promoting fitness and well being- use of various modern and traditional approaches	**16**
Total		**48**

Textbook:

1. Srilakshmi. B; Dietetics, 7th edition, New Age International (P) Limited Publishers, 2014.
2. William's Nix, Basic Nutrition and Diet therapy, 14th edition, Published by Mosby, 2013.

Reference book:

John E. Morleys and David R. Thomas, Geriatric Nutrition, 1st edition, 2007, CRC Press