Loyola Academy Degree & PG College

Year	Sem.	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6
I	I	General English – I AECC – 1 (3)	Value Education and Personality Development AECC – 2 (2)	Introduction to Nutrition (G.E – I) (4)	Introduction to Food Science (4+1) C-1	Anatomy and Physiology (4+1) C – 2	Family Meal Management (4+1) C – 3
I	II	General English – II AECC – 3 (3)	Indian Heritage and Culture AECC – 4 (2)	Human Nutrition G.E – 2 (4)	Food Science & Chemistry (4+1) C - 4	Nutritional Biochemistry (4+1) C – 5	Microbiology (4+1) C - 6
II	III	Environmental Studies and Gender Sensitization (AECC – 5) (3)	Applications of Computers (3+1) SEC - 1	Food Science & Processing (4+1) C - 7	Clinical Biochemistry (4+1) C – 8	Nutritional Assessment and Surveillance (4+1) C - 9	Principles of Food Science, Nutrition and Dietetics (2+1) G.E(ID) – 3
II	IV	Food Science & Sensory Evaluation (4+1) C – 10	Public Health Nutrition (4+1) SEC - II	Food Preservation (3) C – 11	Nutrition of Macro And Micro Nutrients (3+1) G.E – 4	Applied Statistics (3) C – 12	Diet Therapy (4+1) C – 13
III	V	Diet and Medical Nutrition Therapy (4+1) C – 14	Food Quality Control and Testing (4+1) SEC – 3	Institutional Food Service Mngt GE - 5 (3)	Quantity Food Production and Service C – 15 (4+1)	Research Methodology / Food Product Development and Sensory Evaluation DSE – I (4)	Newer Perspectives in Dietetics / Practices in Public Health Nutrition DSE – II (4)
III	VI	Emerging Public Health Problems/ Emergency Nutrition DSE-III (4)	Newer Perspectives in Public Health/Food Packaging DSE-IV (4)	Project (6)			

Legend:
1. Ability Enhancement Compulsory Course (AECC) : 05
2. Generic Elective (GE) : 04
3. Skill Enhancement Course (SEC) : 03
4. Core : 15
5. Discipline-Specific Elective (DSE) : 04
6. . Generic Elective (GE) (ID) : 01

Total

B.Sc. Food Science, Nutrition & Dietetics (2018-21) (Choice-Based Credit System)

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. FOOD SCIENCE, NUTRITION AND DIETITICS
FIRST SEMESTER
ACADEMIC YEAR 2018-19 BATCH 2018-21 (CBCS)

S.No	Part	Subject Code	Title of the Subject	Hours /Week	Duration of Exam (hrs)	Marks			Credits
						Internal	External	Total	
1	I	EN18101	General English-I (AECC-I)	3	3	40	60	100	**3**
2	I	VE18001	Value Education & Personality Development (AECC-2)	2	3	40	60	100	2
3	II	FS18101	Introduction To Nutrition (GE-1)	4	3	40	60	100	4
4	II	FS18102	Introduction To Food Science (Core-1)	4	3	40	60	100	4
5	II	FS 18103	Anatomy and Physiology (Core-2)	5	3	40	60	100	4
6	II	FS18104	Family Meal management (Core-3)	5	3	40	60	100	4
PRACTICALS									
7	II	FS18105	Introduction To Food Science (Core-1)	2	3	40	60	100	1
8	II	FS18106	Anatomy and Physiology (Core-2)	2	3	40	60	100	1
9	II	FS18107	Family Meal management (Core-3)	2	3	40	60	100	1
	TOTAL			29		360	540	900	24

*Ability Enhancement Compulsory Course (AECC) * Generic Elective (GE)

GENERAL ENGLISH -I

Credits : 3 **Semester : I**
Subject Code: EN18101 **No. of Lecture Hours: 45Hrs**
Objectives:

- To enhance the learners' communication skills by giving adequate exposure in reading, writing, listening and speaking skills and the related sub-skills.
- To develop oral and written communicative skills among the students so that their employability enhances and English becomes the medium of their livelihood and personality.

Outcome: Students will be able to identify and implement new linguistic skills and communication skills through role play and group discussions.

UNIT-I **9Hrs**
Wit and Humor
From the text "A Tea Party" by Ruth Prawer Jhabvala

- Explanation of the text 2
- Grammar----Nouns, Articles 2
- Vocabulary---Homonyms, homophones, homographs 2
- Writing Skill--- Note- Making 2
- Speaking Skill – Note-Making 1

UNIT-II **9Hrs**
Risk Management
From the text "Deadly Factory Fires in India."
Explanation of the text 2

- Grammar----Tenses – The Present Tense 2
- Vocabulary ---Synonyms 2
- Writing Skill--- Information Transfer 2
- Speaking Skill--- 1

UNIT-III **9Hrs**
Human Values
From the text" India's Contribution to World Unity"

- Explanation of the text 2
- Grammar--- Tenses- The Past Tense 2
- Vocabulary ---- Adjective and Adverb Suffixes 2
- Writing Skill--- Formal Letters. Curriculum Vitae 2
- Speaking Skill--- JAM 1

UNIT-IV **9Hrs**
The Cyber Age

- From the text "Polymer Bank Notes"
- Explanation of the text 2
- Grammar----Concord or Subject Verb Agreement 2

- Vocabulary -----Word Formation. Collocations. 2
- Writing Skill---- References and Bibliographies. 2
- Speaking Skill--- Presentations 1

UNIT-V **9Hrs**

Sports

From the text "Sachin Tendulkar"

- Explanation of the text 2
- Grammar------Adjectives, Comparison of Adjectives 2
- Vocabulary—Common Errors,Commonly Mispelt Words,Commonly Confused Words 2
- Writing Skill- Technical Reports, Project Reports 2
- Speaking Skill----Group Discussions 1

ESSENTIAL READING:

Skills Annexe. **Functional English for Success. Orient Black Swan**

SUGGESTED READING:

- Balasubramaniam, M. 1985 **Business Communication**. New Delhi: Vani Educational Books.
- Krishna Mohan and Meera Banerjee, 1990. **Developing Communication Skills.** New Delhi: Macmillan India Ltd.
- Krishnaswamy.N. and Sriraman, T. 1995. **Current English for Colleges.** Madras: Macmillan India Ltd.
- Narayanaswamy.V.R. 1979 **Strengthen Your Writing**. New Delhi: Orient Longman.
- Sharma.R.and Krishna Mohan. **Business Correspondence.** 1978. New Delhi. Tata McGraw-Hill Publishing Co.

VALUE EDUCATION & PERSONALITY DEVELOPMENT

Credits : 2 **Semester : I**
Subject code : VE18001 **No. of Lecture hours: 30**
Objective: To produce intellectually competent, morally upright, socially committed, spiritually inspired citizens in the service of the Nation and the World.

Outcome: Students will be transformed in to conscientious citizens through holistic education and contribute Nation Building.

UNIT- I **6Hrs**
Introduction to Ethics
- Why Value Education? 2
- Reasons to have Ethics for Life 1
- Accepted Norms and Counter Values 1
- Dimensions of Human Development: Physical, Intellectual, Emotional, Moral, Spiritual and Social 2

UNIT-II **6Hrs**
Approach to Life
- Conscience and Pseudo-Conscience 1
- Happiness as Life-goal 1
- Values revealed and lived in Religions 1
- Experience of God 1
- Love: The three components of Love 1
- Some of the basic stages and issues of Life: Family, Love, Sex, Marriage 1

UNIT-III **6Hrs**
Concern For Others
- Self and Another 2
- Human Context 2
- Moral Problems of a Society / True Society : Social Desire, Social Fear, Social Silence, Social Indifference 2

UNIT-IV **6Hrs**
Transformation Of Self
- Definitions of personality 1
- Characteristics of personality 1
- Elements of personality 1
- Traits of good personality 1
- Self-Identity, self concept 1
- Self-Discovery, self-acceptance 1
  Self-Esteem

WORK SHEET (1): Self Estimation

UNIT-V **6Hrs**

Life Enrichment Skills

- Purpose of life - Goal setting
- Characteristics of Goals 1
- Building Relationships
- Time Management 1
- Stress Management
- Emotional Management 2
- Conflict Management 1
- Team Management (Group Dynamics) 1

WORK SHEETS (1) & (2): 1) Anger Management
2) Team Management

ESSENTIAL READING:

1. Human Values - Development Programme - AIACHE
2. In Harmony

INTRODUCTION TO NUTRITION

Credits : 4 **Semester : I**
Subject Code: FS18101 **No. of lecture hours: 60**

Objectives : To promote basic knowledge of macro-nutrients and micro-nutrients
To enable the students to know about the factors affecting the availability and requirements of nutrients

Outcome: The students will understand common nutritional disorders due to imbalance of macro-nutrients and micro-nutrients and nutrient interrelationships

Unit-I

History of Nutrition and Energy Requirements **12Hrs**

- History of nutrition 2
- Components of energy expenditure – Basal Metabolic Rate, Physical Activity and Thermal Effect of Food 3
- Measurement of energy in foods 2
- Measurement of human energy expenditure 3
- Recommended energy allowances 2

Unit II

Body Composition and Body Weight and Nutritional Disorders **12Hrs**

- Disorders due to Deficiency or Imbalance of Nutrients 2
- Body composition and techniques for measuring Lean body mass, Body fat, Body water, Body mineral mass. 2
- Body weight versus body fat
  a. Overweight
  b. Obesity 2
- Body composition of Asians: BMI, body lab and health Implications 2
- Concept of Nutrition Transition in India 2
- Protein and energy imbalances and changes in body Composition 2

Unit III

Nutritional Aspects of Carbohydrates **12Hrs**

- Sources and the relative importance of different carbohydrates in the diet 2
- Percent of energy from carbohydrates in Indian diets 2
- Digestion, absorption and utilization of absorbed carbohydrates in the body 2
- Regulation of blood glucose levels 2
- Role of dietary fiber in human nutrition 2
- Carbohydrate intolerance, Lactose intolerance, Dental caries 2

Unit IV

Nutritional Aspects of Lipids **12 Hrs**

- Definition, classification, functions and sources of fats. 2
- Fatty acids 1
- Saturated, monounsaturated and polyunsaturated fatty acids 2
- Essential fatty acids, Function, Requirements of essential fatty acids 1
- Digestion, Absorption and transport of fats. 3
- Deficiency symptoms 1
- Role of Dietary fats in Health and Disease 2

Unit V

Nutritional Aspects of Proteins **12 Hrs**

- Functions and sources of proteins 1
- Amino acids as building blocks of proteins,Essential and non-essential amino acids 2
- Functions and Utilization of amino acids by the body 2
- Amino acid imbalance, Nitrogen balance 2
- Evaluation of protein quality 1
- Protein deficiency,Requirements and allowances 1
- Digestion and Absorption of fats. 2
- Oxidation of Amino Acids 1

SUGGESTED READING

- Swaminathan M (2000). Advanced Textbook on Foods and Nutrition, Vol I (2 nd ed.). Published by Bangalore Printing and Publishing Ltd, Bangalore
- Bamji MS, Prahlad Rao N and Reddy V (2010). A Textbook on Human Nutrition (3 rd Edition). Published by Oxford and IBH Publishing Co., New Delhi
- Garrow JS, James WPT, Ralph A and James JPT (2000). Human Nutrition and Dietetics (10 th ed.) Published by Churchill Livingstone. ISBN-10: 0443056277, ISBN-13: 978-0443056277
- Gibney MJ, Macdonald IA and Roche H (2010). Nutrition and Metabolism (2 nd ed.). Published by Wiley-Blackwell, ISBN: 978-1-4051-6808-3
- Geissler C (2009). Fundamentals of Human Nutrition. Churchill Publications, US.
- Krause and Mahan (2008). Food Nutrition, Diet Therapy (12 th ed.). Published byWB Saunders Company

INTRODUCTION TO FOOD SCIENCE

Credits : 4 **Semester : I**
Subject Code: FS18102 **No. of lecture hours: 60**

Objective: To study the structure, composition and chemistry of food constituents

Outcome: Students will gain knowledge regarding the chemistry of various food constituents.

UNIT –I 12 Hrs
Food Groups

- Classification, Food in relation to health, Food as a source of nutrients 3
- Objectives of cooking, preliminary preparations, processing, preservation. 3
- Methods of cooking – Wet methods- Boiling, simmering, poaching, stewing, blanching, steaming, pressure cooking – their merits and demerits. 2
- Dry methods – Roasting, grilling, toasting, baking, sauteing, frying - merits and demerits 2
- Effect of cooking and heat on nutritive value of foods 2

UNIT – II 12 Hrs
Preservation methods

- Principles and methods of processing and preservation 4
- Blanching, Heat processing and preservation 2
- Cold processing and preservation 2
- Dehydration, Irradiation, Microwave and Ohmnic heating 2
- Fermentation 2

UNIT - III 12 Hrs
Carbohydrates and proteins

- Carbohydrates – Classification, structure , chemical reactions of carbohydrates – oxidation, reduction. Starch, glycogen, cellulose, pectin and hemicellulose 3
- Chemical properties 1
- Proteins: classification and structure 2
- Nature of food proteins (plant and animal proteins) 1
- Functional Properties: (Hydration, Solubility, Viscosity, Gelatin, Texturization, Emulsification and Foaming) 3
- Nutritional Properties 2

UNIT – IV **12 Hrs**

Lipids

- Lipids: - classification of lipids, definition and examples 3
- Fats and oils, sterols, phospholipids 3
- Physical properties of fats and oils() 2
- Chemical properties (oxidation, hydrogenation etc.,). 4

UNIT – V **12 Hrs**

Water, Vitamins and Minerals

- Water: - Definition of water in food 2
- Structure: Ice, Water- Availability in foods: Water composition 2
- Isotherms – Effect of Water Activity on Food stability (Shelf life). 2
- Vitamins - Classification, Structure, Sources. 2
- Minerals- Types, Sources. 3
- Effect of Processing on vitamins 1

SUGGESTED READING

1. Owen R. Fennema, 1996 **Food Chemistry**, 3rd Edition, New York: Marcel and Dekker Publishers.
2. Meyer L.H, 2004 **Food Chemistry**, 1st Edition, New Delhi: CBS Publishers.
3. Norman N. Potter, 1996, **Food Science**, 5th Edition, New Delhi: CBS Publishers.
4. B. Srilakshmi, 2001 **Food Science**, 2nd Edition, New Delhi: New Age International.

ANATOMY AND PHYSIOLOGY

Credits : 4 **Semester : I**
Subject Code: FS18103 **No. of lecture hours: 75**

Objectives:

- To familiarize students with specific terminology
- To enable the students to learn structure and functions of organs
- To prepare the students to understand the physiology of human body

Outcome: Students will gain knowledge on the structure, function and physiology of human body

Unit I

Basic Aspects of Anatomy and Physiology **15Hrs**

- Anatomical aspects of the body-Anatomical terms,Surface anatomy 3
- Cell as a unit of the bodyCell organelles and their functions, Cell division,Tissues-types structure and functions. 4
- Immunology General principles, types of immunoglobulin (Ig), General structure of immunoglobulin (Ig),T-Cells, B-Cells structure & function, Humoral and cell mediated immunity 4
- Cancer and HIV, Causes and consequences, Nutritional Benefits to reduce the risk factors 4

Unit II

Digestive and Respiratory Systems **15Hrs**

- Digestive System- Major organs of the digestive system 2
  Anatomy of the alimentary canal 2
  Functions of the organs of digestive system. 2
  Physiology of digestion. 2
  Absorption mechanism-Importance of Na + /Cl - ; Na + glucose transporter.
  Elimination of unabsorbed food materials. 2
  Digestion and absorption of food and the role of enzymes and hormones 2
- Respiratory system- Major organs of the respiratory system. 1
  Functions of the organs of respiratory system.
- Physiology of exchange of gases. 1
  Muscular exercise-tidal and vital volumes. 1

Unit III

Circulatory, Hormonal Endocrine Glands **15Hrs**

- 1. Circulatory system 5
  a. Blood
  (i) Blood and its composition
  (ii) Blood groups
  (iii) Coagulation of blood

- b. Structure of heart 5
  (i) Arterial system, venous system-afferent efferent vessels
  (ii) Blood circulation
  (iii) Structure and functions of heart-detail
  (iv) Heart rate, Cardiac output, blood pressure and its regulation
  (v) Circulation of blood
  (vi) Cardiac cycle and Purkinje fibres
- Hormonal Endocrine glands – Name and general functions 5
  a. Pituitary
  b. Thyroid
  c. Parathyroid
  d. Pancreas
  e. Adrenal
  f. Sex glands (male and female)

Unit- IV

Nervous, Musculoskeletal Systems **15Hrs**

- Nervous System
  a. Nerve cell structure and function 8
  b. Brain-Major division and sensory motor neurons
  c. Central nervous system, Autonomic NS, ParasympatheticNS
- Musculoskeletal System
  a. Types of muscles, functions 7
  b. Skeletal system – formation of bone and teeth

Unit- V

Reproductive and Excretory System **15Hrs**

- Reproductive System
  a. Structures and functions of sex glands and organs including hormones 2
  b. Menstrual cycle-estrogen verses progesterone 2
  c. Testosterone-single hormone impact 2
  d. Physiology of pregnancy-intra uterine layers-role of B6/B12 vitamins in euronal development 1
  e. Parturition, Lactation and Menopause
  f. Life long-Nutrition based approaches for a healthy life for women 1

  Excretory System
  a. Structure and functions of Kidney, bladder, formation of urine 2
  b. Counter current mechanisms in regulating blood pressure 2
  c. Structure and function of skin- Regulation of body temperature 3

SUGGESTED READING

1. Best CH and Taylor (1989). The Human Body. Published by Asia, New Delhi, National Book depot, Mumbai, India.
2. Bijlani RL(1995). Understanding Medical Physiology. Published by Jaypee Brhers Medical (P) Ltd, New Delhi, India
3. Winwood (1988). Sear's Anatomy and Physiology for nurses. Published by Edward Arnold, London
4. Wilson (1989). Anatomy and Physiology in Health and Illness. Published by Churchill Livingstone, Edinburgh
5. Chatterjee CC (1988). Text book of Medical physiology. Published by W.B, London
6. Pearce Evelyn (1992). Anatomy and Physiology for Nurse. Published by Faber & Faber Ltd, London
7. Iyer E (1975). Text book of Zoology –Vol II
8. Silverthorn, D. Human Physiology, (5 th ed). Published by Benjamin-Cummings Pub Co

FAMILY MEAL MANAGEMENT

Credits : 4 **Semester : I**
Subject Code: FS18104 **No. of lecture hours: 75**

Objective:

- To understand the concept of an adequate diet and the importance of meal planning
- To know the factors affecting the nutrient needs during the lifecycle and the RDA for various age groups

Outcome: Students will gain knowledge regarding the practical aspects of meal planning and prepare nutritionally adequate diets in relation to age, activity levels, physiological state and socio-economic status

UNIT-I

Food groups **15 Hrs**

- Basic terms, Food groups system, food exchange list, food composition data base 5
- Planning of balanced diet 2
- Principles of meal planning 2
- Food guide- food pyramid, my pyramid, mediterranean diet, my plate, dietary guidelines 2
- Low cost balanced diets. 1
- Nutritional Screening(A,B,C,D method) 3

UNIT-II

Nutrition in pregnancy and lactation **15 Hrs**

- Nutrition in pregnancy- physiological stages of pregnancy, expected weight gain, preconceptual nutrition 5
- Nutritional and food requirements, complications 3
- Nutrition in lactation- role of hormones, Indian nursing mothers 4
- Nutritional and food requirements 3

UNIT-III

Nutrition in infancy and preschool children **15 Hrs**

- Nutrition in infancy- nutritional and food requirements 4
- Preterm baby and weaning 3
- Nutrition in preschool- nutritional and food requirements 4
- Nutrition related problems 4

UNIT-IV

Nutrition in school children and adolescence **15 Hrs**

- Nutrition in school children- nutritional and food requirements 4
- Packed lunches and school lunch programmes 5
- Nutrition during adolescence – nutritional and food requirements 4
- Nutritional problems 2

UNIT-V

Nutrition for adults and geriatrics **15 Hrs**

- Nutrition for adults- nutritional and food requirements, types of effects in adults 5
- Nutrition in old age- process of ageing, nutritional and food requirements 5
- Nutrition related problems, degenerative diseases, exercise, drugs 5

SUGGESTED READING

1. Bamji MS, Krishnaswamy K, Brahmam GNV 2009. **Textbook of Human Nutrition**, 3rd edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
2. Srilakshmi 2007, **Food Science**, 4th Edition. New Delhi: New Age International Ltd.
3. Wardlaw MG, Paul M Insel Mosby 1996 . **Perspectives in Nutrition**, Third Edition. New Jersey: Blackwell Publishers.
4. Khanna K, Gupta S, Seth R, Mahna R, Rekhi T 2004. **The Art and Science of Cooking: A Practical Manual**, Revised Edition. Bhopal: Elite Publishing House Pvt Ltd.
5. NIN, ICMR 1990 . **Nutritive Value of Indian Foods**.
6. Seth V, Singh K 2005. **Diet planning through the Life Cycle: Part 1. Normal Nutrition**. A Practical Manual, Fourth edition, Bhopal: Elite Publishing House Pvt Ltd.
7. ICMR 2010 . **Nutrient Requirements and Recommended Dietary Allowances for Indians**.

INTRODUCTION TO FOOD SCIENCE
PRACTICALS

Credits : 1 **Semester : I**
Subject code: FS18105 **No. of Practical hours: 30**

Objective: To analyze the chemical constituents of foods

Outcome: Students will independently analyze the various constituents of foods**.**

- Sampling & sample preparation 1
- Estimation of Moisture and total solids analysis 3
    1. Hot air oven
    2. Karl Fischer titration
- Estimation of Sugars – Reducing, non reducing, total sugars 2
- Estimation of Protein by Kjeldhal Method. 2
- Estimation of Fat by Soxhlet method 2
- Estimation of Ash, Acid insoluble ash and sulphated ash 3
- Estimation of Browning- enzymatic and non-enzymatic 1
- Estimation of total soluble solids using refractometer 1

SUGGESTED READING

1. Pomeranz Y and Meloan C E., 1996 **Food Analysis: Theory and Practice**, 3rd Edition, New Delhi: CBS Publishers.
2. Nielsen S S., 1994 **Introduction to the chemical analysis of foods**, London: Jones and Bartlett Publishers.
3. Nielsen S S. 2003 **Food Analysis Laboratory Manual**, USA: Chips Ltd.

ANATOMY AND PHYSIOLOGY
PRACTICALS

Credits : 1 **Semester : I**
Subject code: FS18106 **No. of Practical hours: 30**

Objectives:

- To familiarize students with specific terminology
- To enable the students to learn structure and functions of organs
- To prepare the students to understand the physiology of human body

Outcome: The students will get familiar with the physiology and structure of human body.

1.	Estimating own Hb content. (using Haemocytometer)	2
2.	Estimation of Hb count by Drapkin solution	2
3.	Determination of Blood Group	2
4.	Measuring pulse rate	2
5.	Demonstration to measure blood pressure.	1
6.	Measurement of grip strength	2
7.	Slides of sections of various organs, tissues etc.	2
8.	Use of Pedometer for physical activity.	2

SUGGESTED READING

1. Best CH and Taylor (1989). The Human Body. Published by Asia, New Delhi, National Book depot, Mumbai, India.
2. Bijlani RL(1995). Understanding Medical Physiology. Published by Jaypee Brhers Medical (P) Ltd, New Delhi, India
3. Winwood (1988). Sear's Anatomy and Physiology for nurses. Published by Edward Arnold, London
4. Wilson (1989). Anatomy and Physiology in Health and Illness. Published by Churchill Livingstone, Edinburgh
5. Chatterjee CC (1988). Text book of Medical physiology. Published by W.B, London
6. Pearce Evelyn (1992). Anatomy and Physiology for Nurse. Published by Faber & Faber Ltd, London
7. Iyer E (1975). Text book of Zoology –Vol II
8. Silverthorn, D. Human Physiology, (5 th ed). Published by Benjamin-Cummings Pub Co

FAMILY MEAL MANAGEMENT
PRACTICALS

Credits : 1 **Semester : I**
Subject code: FS18107 **No. of Practical hours: 30**

Objective:

- To understand the concept of an adequate diet and the importance of meal planning
- To know the factors affecting the nutrient needs during the lifecycle and the RDA for various age groups

Outcome: Students will gain knowledge regarding the practical aspects of meal planning and prepare nutritionally adequate diets in relation to age, activity levels, physiological state and socio-economic status

1.	Conversion of weights and volumes of raw foods to cooked foods	1
2.	Food exchange system and its application	1
3.	Plan and prepare Weaning food for infants	2
4.	Plan and prepare Packed Lunch for School Going Child.	2
5.	Plan and prepare Adolescent diet	2
6.	Plan and prepare diet for adult (heavy worker)	2
7.	Plan and prepare diet for Pregnancy woman	1
8.	Plan and prepare diet during Lactation	1
9.	Plan and prepare diet for Geriatric	1
10.	Modification of normal diet for therapeutic use- soft, fluid and bland diet	2

SUGGESTED READING

1. Gopalan C, Rama Sastri BV and Balasubramanian SC (1993). Revised and updated by Narasinga Rao BS, Deosthale YG and Paul KC. Nutritive Value of Indian Foods, Hyderabad. National Institute of Nutrition, Indian Council of Medical Research.
2. Sharma S (2000). Human Nutrition and Meal Planning. Published by Mrs. S Chowdhary for Jnanada Prakashan (P&D) (JNANADA), 24, Daryaganj, N.Delhi.
3. Bernstein, M. (2010). Nutrition for the older Adult. Published br Jones
4. BLutz C and Przytulski K (2010). Nutrition and Diet therapy: evidence based applications, (4 th ed). Published by Jaypee Brothers, New Delhi ISBN 978-81-8448-247-8
5. Zimmermann M (2010). Burgerstein's Handbook of Nutrition, micronutrients in the prevention and therapy of disease. Published by Thieme, New York and reprint by Medical and Scentific publisher pvt. Ltd., Noida, U.P.
6. Staci Nix (2005). Williams basic Nutrition & Diet therapy.Published by Elsevier, St. Louis, US

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS

B.Sc. FOOD SCIENCE, NUTRITION AND DIETITICS

SECOND SEMESTER

ACADEMIC YEAR 2018-19 BATCH 2018-21 (CBCS)

S. No	Part	Subject Code	Title of the Subject	Hours / Week	Duration of Exam (hrs)	Marks			Credits
						Internal	External	Total	
1	I	EN18201	General English-II (AECC-3)	3	3	40	60	100	**3**
2	I	IC19001	Indian Heritage and Culture (AECC-4)	2	3	40	60	100	2
3	II	FS18201	Human Nutrition (GE-2)	4	3	40	60	100	4
4	II	FS18202	Food Science and Chemistry (Core-4)	5	3	40	60	100	4
5	II	FS18203	Nutritional Biochemistry (Core-5)	5	3	40	60	100	4
6	II	FS18204	Microbiology (Core-6)	4	3	40	60	100	4
PRACTICALS									
7	II	FS18205	Food Science and Chemistry (Core-4)	2	3	40	60	100	1
8	II	FS18206	Nutritional Biochemistry (Core-5)	2	3	40	60	100	1
9	II	FS 18207	Microbiology (Core-6)	2	3	40		100	1
10	III	PL18001	PLANET* (Outreach)	-	-	-		-	1
	TOTAL			29		360	540	900	25

*Ability Enhancement Compulsory Course (AECC)

* Programme of Loyola Academy for Neighbourhood Empowerment & Transformation (PLANET)

GENERAL ENGLISH -II

Credits : 3 **Semester : II**
Subject Code: EN18201 **No of Lecture Hours: 45**
Objectives:

- To enhance the learners' communication skills by giving adequate exposure in reading, writing, listening and speaking skills and the related sub-skills.
- To develop oral and written communicative skills among the students so that their employability enhances and English becomes the medium of their livelihood and personality.

Outcome: Students will be able to improve Language in a holistic way through application, differentiation, organization and creation of their own composition in writing skills.

UNIT- I **9Hrs**
Biography
From the text "Mokshagundam Visvesvaraya"
Explanation of the text, 2

- Grammar –--- Conjunctions, Adverbs 2
- Vocabulary ----- Prefixes and Suffixes 2
- Writing Skill ------Paragraph Writing 2
- Speaking Skill—Role Plays 1

UNIT-II **9Hrs**
Health
From the text "Three Days to See"
Explanation of the text 1

- Grammar -------Usage of Modal Auxiliary Verbs 2
- Vocabulary --- Collective Nouns ,Technical Vocabulary 2
- Writing Skill ------Report Writing 2
- Speaking Skill -----Jam 2

UNIT-III **9Hrs**
Short Story
From the text "Leela's Friend" by R.K.Narayan

- Explanation of the text 2
- Grammar----Phrasal Verbs, Wh- Questions 2
- Vocabulary----Noun and Verb Suffixes 2
- Writing Skill------Writing a Narrative 2
- Speaking Skill --Debates 1

UNIT-IV **9Hrs**
Inspiration
From the text "The Last Leaf" by O. Henry

- Explanation of the text 2
- Grammar----- Prepositions 2
- Vocabulary-----Idioms 2

- Writing Skill----- Précis Writing 2
- Speaking Skill--- Presentations 1

UNIT-V **9Hrs**

Human Interest

From the text" The Convocation Speech"

Explanation of the text 2

- Grammar---- Active and Passive Voice 2
- Vocabulary-----One-word Substitutes 2
- Writing skill------ Essay Writing 2
- Speaking Skill---- Group Discussion 1 1

ESSENTIAL READING:

Epitome of Wisdom, Maruthi Publications.

SUGGESTED READING:

1. Krishna Mohan and Meera Banerjee. **Developing Communication Skills**. 1990. New Delhi. Macmillan India Ltd..
2. Krishnaswamy.N. and Sriraman, T. **Current English for Colleges**. 1995. Madras Macmillan India Ltd.
3. Narayanaswamy, V.R.. **Strengthen Your Writing**. 1979. New Delhi. Orient Longman.
4. Sharma, R.C. and Krishna Mohan. **Business Correspondence**. 1978. New Delhi. Tata McGraw-Hill Publishing Co.

INDIAN HERITAGE & CULTURE

Credits : 2 **Semester : II**
Subject Code : IC19001 **No. of Lecture Hours: 30**

Objectives:
- To apprise the students with a sound background of Indian Culture.
- To equip the students with social & community problems of India.
- To prepare the student for civil service exams where Indian Heritage & Culture paper is compulsory for all the streams.

Outcome: Students will be knowledgeable about Indian custom, traditions and also be able to attempt competitive exams.

UNIT-I **6 Hrs**
Introduction – Impact Of Geography On Indian Culture
- Meaning of culture – Characteristics of Indian Culture, Caste system 2
- Indus Valley Civilization and Vedic/Aryan Culture 2
- Golden Age of Indian Culture– Mauryas and Guptas, Satavahavas, Pallavas, Cholas. 2

UNIT-II **6 Hrs**
Medieval India – Influence Of Islam On Indian Culture
- Cultural Development under the Delhi Sultanate and Mughals 1
- Contribution of Sher Shah and Akbar to Indian Administrative System 2
- Cultural Achievements of Vijayanagara and Kakatiya rulers 1
- Fine Arts – Sculpture, Painting, Music and Dance 2

UNIT-III **6Hrs**
Indian Religion and Impact of West
- Western Education – Socio Religious Reform Movement 1
- Rise of Indian National movement – Mahatma Gandhi – Non violence and Satyagraha – Eradication of untouchability 2
- Ishwara Chandra Vidyasagar and Veerasalingam – Emancipation of women and struggle against caste. 1
- Hinduism – Islam – Christianity – Sikhism – Zoroastrianism – Jainism and Buddhism 2

UNIT-IV **6Hrs**
Children And Youth Issues
- Child Abuse, Child Labour – Effects of Abuse on Children 1
- Youth Unrest – Important agitations and movements by Youth 1

- Terrorism – Causes and Consequences 2
- Alcoholism, Drug Addiction and other deviations 2

UNIT-V **6Hrs**

Women, Gender Related Issues and Rights

- Violence against Women – Transgender issues – LGBT 2
1. Know your Rights – Classification of Rights and Importance 2
2. Changing local and national politics – Making our world a better place 2

SUGGESTED READING:

1 Jha, Dr K.N. **Studies in ancient & Medieval India**. 2006. Gurgaon: COSMOS Book hive Ltd.

2 Mahajan, V.D. **Ancient India**. 2008. New Delhi: S.Chand.

3 Manasseh, Dr P. 2010. **An Overview of Indian Culture**. Hyderabad: Gamaleil Publishers,

4 Malpani, Madanlal & Malpani, Shamsunder. 2014 **Indian Heritage and Culture**. Ludhiana: Kalyani Publishers.

5 Mhaske, Dr R.H. 2012 **Human Rights, Social Justice and Political Challenges**. . Kanpur: Chandralok Prakashau.

6 Singh, Gurdip & Ahuja, V.K. 2012 **Human Rights in 21st Century**. New Delhi: Universal Law Publisher.

HUMAN NUTRITION

Credits : 4 **Semester : II**
Subject code: FS18201 **No. of lecture hours: 60**

Objectives:

- To promote basic knowledge of macro-nutrients
- To enable the students to know about the factors affecting the availability and requirements of nutrients
- To promote understanding of common nutritional disorders due to imbalance of macro-nutrients
- To promote an understanding of nutrient interrelationships

Outcome: Students will gain knowledge regarding nutrients and their importance

Unit I

Food Based Dietary Guidelines and RDA **12 Hrs**

- National dietary goals and dietary guidelines- Principles and process of development of dietary guidelines 2
- Dietary guidelines of selected developed and developing Countries 2
- Indian dietary guidelines 2
- Visual presentation of dietary guidelines- Food guide pyramids, eat well Bermuda, French stairs 2
- Definitions of key terms : RDA, RDI, upper tolerable limits, EAR, ESSADI, MDR etc 2
- Nutritional Labelling : Key terms 2

Unit II

Regulation of Body weight and Eating disorders **12 Hrs**

- Regulation of body weight 2
  (i) Role of hormones – leptin, ghrelin and insulin
  (ii) Control of food intake and energy balance
- Body weight Imbalances: Overweight and Obesity 2
  (i) Assessment
  (ii) Etiology & Health Risks
  (iii) Common problems encountered in obesity management
  (Plateau effect and Weight cycling)
- Eating disorders 2
  (i) Anorexia nervosa
  (ii) Bulimia nervosa
- Interrelationship between Under nutrition, Infection and Immunity 2
- Interrelationship between Obesity and Non communicable diseases 2
- Metabolic adaptations during starvation 1
- Fetal origins concept and its consequences 1

Unit III

Nutritional Aspects of Vitamins **12Hrs**

- Vitamins – (Vitamins A, D, E and K, Thiamine, Riboflavin, Niacin, Pyridoxine, Ascorbic Acid, B 12) and Minerals (Calcium, Phosphorous, Iron, Iodine, Copper, Zinc, Selenium) 6
- Vitamins 6
  a. Absorption, transport, storage, excretion
  b. Functions and daily requirements
  c. Deficiencies and Toxicity

Unit IV

Nutritional Aspects of minerals

- Minerals 4
  a. Absorption, transport, storage, excretion
  b. Factors affecting bioavailability
  c. Functions
  d. Deficiencies
  e. Requirements
- Nutrient – Nutrient Interactions and implications for Community Nutrition. 4
- Micronutrient deficiencies of vitamin A, Iron, Iodine, Zinc 4

Unit V

Antioxidants in health and Disease

- Antioxidants – Definition and oxidative stress 2
- Effects of antioxidants on macro molecules (Carbohydrates, proteins, lipids and nucleic acids) 3
- Antioxidant defense system (Enzymatic and NonEnzymatic) 2
- Location of action of various antioxidants 3
- Food sources of antioxidant nutrients 2

SUGGESTED READING

1. Swaminathan M (2000). Advanced Textbook on Foods and Nutrition, Vol I (2 nd ed.). Published by Bangalore Printing and Publishing Ltd, Bangalore
2. Bamji MS, Prahlad Rao N and Reddy V (2010). A Textbook on Human Nutrition (3 rd Edition). Published by Oxford and IBH Publishing Co., New Delhi
3. Garrow JS, James WPT, Ralph A and James JPT (2000). Human Nutrition and Dietetics (10 th ed.) Published by Churchill Livingstone. ISBN-10: 0443056277, ISBN-13: 978-0443056277
4. Gibney MJ, Macdonald IA and Roche H (2010). Nutrition and Metabolism (2 nd ed.). Published by Wiley-Blackwell, ISBN: 978-1-4051-6808-3
5. Geissler C (2009). Fundamentals of Human Nutrition. Churchill Publications, US.
6. Krause and Mahan (2008). Food Nutrition, Diet Therapy (12 th ed.). Published byWB Saunders Company

FOOD SCIENCE AND CHEMISTRY

Credits : 4 **Semester : II**
Subject code: FS18202 **No. of lecture hours: 75**

Objectives

- To impart knowledge pertaining to the functional properties of nutrients
- To provide basic understanding of food additives and pigments
- To provide knowledge on the role of water and enzymes in food

Outcome: The students will gain knowledge on the functional properties of nutrients in food.

Unit I
Functionality of Protein and Carbohydrates and Lipids **15 Hrs**

- Functionality of proteins - hydration and solubility, surface-active properties-emulsion and foaming, gelation, dough, texturization, flavour binding. 5
- Functionality of carbohydrates - Resistant starch, complex carbohydrates, fibers, gums,pectin, modified starches bulking, gelation, viscosity modifiers, sweeteners- principles of sweetening, glazing, flavor fixatives 5
- Functionality of lipid - emulsion, crystallinity, polymorphism, palatability. Physicochemical Properties- Melting point, Cloud point, Smoke Flash and Fire Points, Rheology. 5

Unit - II
Water and Water activity **15 Hrs**

- Water
  a. Properties of water-melting point, boiling point, surface tension, specific heat, dielectric constant, latent heat of fusion, vaporisation and sublimation
  b. Structure of ice and effect of salts on aqueous solutions 5
- Types of water – free and bound water 2
- Relative humidity 1
- Water activity and its significance 2
- Functionality of water in foods: Principles and properties of colloidal systems, Emulsions, Emulsifiers, Viscosity, Surface tension and Surfactants. 5

Unit-III
Enzymes in Foods **15 Hrs**

- Enzymes: Classification, Specificity, Catalysis and regulations. 3
- Factors affecting enzyme activity. Occurrence of enzymes in foods and their role Enzyme inhibitors in foods 3
- Immobilised enzymes 2
- Enzymes in food processing – manufacture of cheese, 2
- cheese spreads and other indigenous products 2
- Browning reactions in foods: enzymatic and non-enzymatic, Methods to prevent browning. 3

Unit – IV

Food Additives **15 Hrs**

- Introduction to food additives 3
- Classification of Food Additives and their role in food industry 5
- Risks and benefits of different food additives 2
- Food additives and hypersensitivity 5

Unit-V

Pigments **15 Hrs**

- Structure, properties and effect of processing on plant and animal pigments 3
- Haemoglobin, Myoglobin, 3
- Chlorophyll, Carotenoids, anthocyanins and flavanoids. 9

SUGGESTED READING:

1. Sethi Mohini / Rao E. S. (2011). Food Science Experiments and Applications. Second edition .CBS Publishers, New Delhi.
2. M. Swaminathan (1979). Food Science and Experimental Foods. Ganesh and Co. Madras
3. Charley H (1982). Food Science. John Wiley and Sons, Inc., New York
4. Potter Norman and Hotchkiss JH (2007). Food Science. C.B.S. Publishers, New Delhi.
5. Sri Lakshmi B (1997). Food Science. Newage International, New Delhi.
6. Vashisht Meera (1998). Introduction to Food, Nutrition and Food Processing. Anmol Publication Pvt Ltd, New Delhi.
7. Yadav S (1997). Food Chemistry. Anmol Publication Pvt Ltd, New Delhi.
8. Vieira E (2010). Elementary Food Science (4 th ed.) Chapman Hall
9. Laxmi Lal (2010). Fruit Science: Objective Fundamentals, Agrotech Publishing Department of Foods and Nutrition

NUTRITIONAL BIOCHEMISTRY

Credits: 4 **Semester: II**
Subject code: FS18203 **No. of lecture hours: 75**

Objectives

- To develop an understanding of the principles of biochemistry.
- To obtain an insight into the chemistry of major nutrients and physiologically important compounds
- To apply the knowledge in the field of human nutrition and dietetics
- To enable students to gain practical knowledge regarding the basic methods involved in analysis of different nutrients.

Outcome: The students will gain practical knowledge in analyzing different nutrients

Unit- I

Membrane Structure, Enzymes **15Hrs**

- Membrane structure and functions 3
- Transport of metabolites across membranes 3
- Definition, importance, nomenclature and classification of enzymes, factors affecting enzyme activity 5
- Coenzymes, cofactors, enzyme inhibition and regulation. 4

Unit- II

Clinical enzymology and Biologic Oxidation **15Hrs**

- Clinical enzymology : Diagnostic value of serum enzymes And isoenzymes 6
- Importance of biologic oxidation 2
- Components of electron transport chain 4
- Oxidative phosphorylation and ATP generation 3

Uniy- III

Carbohydrates **15Hrs**

- Carbohydrate Chemistry and Metabolism 2
- Importance, classification of carbohydrates 3
- Metabolism of carbohydrates: Glycolysis, Citric Acid Cycle, Glycogenesis, Glycogenolysis, Gluconeogenesis 6
- Hexose Monophosphate Shunt 2
- Blood sugar regulation 2

Unit- IV

Lipid Chemistry and Metabolism **15Hrs**

- Importance, classification and properties of lipids 2
- Metabolism of lipids: Oxidation of fatty acids, fatty acid synthesis, Metabolism of unsaturated fatty acids 6
- Metabolism of triglycerides, chain elongation and

desaturase system	4
● Types of lipoproteins and their functions	3

Unit- V

Amino Acids and Proteins	**15Hrs**
● Amino Acids and Proteins – Chemistry and Metabolism	2
● Structure of proteins – primary, secondary, tertiary and quarternary structures	2
● Functions of proteins	2
● Classification of amino acids	2
● Biologically important peptides	2
● General reactions: Transamination, deamination and decarboxylation reactions	3
● Urea cycle	2

SUGGESTED READING:

1. Deb AC (2001). Fundamentals of Biochemistry. Published by New Central Book Agency, Calcutta.
2. Weil JH (1990). General Biochemistry (6 th ed.). Published by Wiley Eastern Ltd, New Delhi
3. Murray R, Rodwell V, Bender D, Botham KM, Weil PA, Kennelly PJ (2009).
4. Harper's Illustrated Biochemistry (28 th ed.) Published by McGraw-Hill Medical.
5. Conn EE and Stumpf PK, Bruening G and Doi RH (2006). Outlines of Biochemistry (5 th ed.). Published by Wiley India Pvt. Ltd.
6. Mahansan, R. (2009). Practical Biochemistry. Published by Vayau Edu
7. Hames BD and Hooper NM (2003). Biochemistry. (2 nd ed). Published by Viva books private limited, New Delhi, India
8. Sharma S (1993). Practical Biochemistry (1 st ed.). Published by Jaipur : Classic Publishing House.
9. Plummer D T (2008). An introduction to Practical Biochemistry (3 rd ed.). Published by Tata McGraw Hill.

MICROBIOLOGY

Credits : 4 **Semester : II**
Subject code: FS18204 **No. of lecture hours: 60**

Objective: To study the various microorganisms associated with foods.
Outcome: Students will gain knowledge on various microorganisms associated with foods.

UNIT I — 12 Hrs

Food Microbes

- Micro organisms associated with foods: 2
- Bacteria
  (Gram negative aerobic Rods, Gram negative facultative anaerobic Rods) 2
- Gram Negative anaerobic rods, 2
- Endospore formers Irregular non-sporing gram positive rods 2
- Yeasts & molds their role in food spoilage – 1
- Factors affecting growth of bacteria, mold and Yeast: 2
  (Nutrition, Temperature, pH conditions, Carbon and Nitrogen Sources
- Redox potential, antimicrobial barriers and constituents. 1

UNIT II — 12 Hrs

Microbial Estimation

- Sources of microorganisms – Soil, water, plants and of animal origin 1
- Useful microorganisms – Bacteria, Yeast, mold and fungi 1
- Estimating number of microorganisms, sampling, sample size 2
- Aseptic collection of samples, total cell counts and 2
  viable cell counts, plate counters.
- Indicator organisms 2
- Alternative and Rapid methods for detection of specific microbes and 1
  toxins
- Dye-reduction tests, Electrical methods, ATP determination – 1
- Pure cultures-preparation, maintenance and preservation – 1
- Microbiological quality control and HACCP 1

UNIT III — 12 Hrs

Micro organisms associated with food & water

- Microbiology of Food commodities 1
- Contamination, preservation and spoilage & beneficial
  role of microorganisms in
  - Cereals, Pulses 2
  - Nuts and Oilseeds, 2
  - Fruits and Fruit products 2
  - Vegetables and Vegetable products 2
  - Meat , dairy and their products 2

- Microbiology of water- Contamination and microbial standards 1

UNIT IV **12 Hrs**

Food Preservation

- Heat processing: Pasteurization and appertization 1
- Determination of D and z values 2
- Heat sensitivity of micro-organisms & Spoilage of canned foods 1
- Aseptic packaging, Irradiation 2
- Brief account of microwave 1
- UV and ionizing radiation 1
- Brief account of High pressure processing 1
- Low temperature storage – Chilling and freezing 1
- Effect of chemical and natural preservatives on microbes in food 2

UNIT V **12 Hrs**

Food Borne Illnesses

- Food borne pathogens 1
- Food poisoning 1
- Food borne infections 2
- Food borne Intoxications (*Aeromonas hydrophila, Bacillus cereus, Brucella, Camphylobacter, Clostridium botulinum,Clostridium perfringenes, Escherichia coli, Salmonella, Staphylococcus aureus, vibrio, yersininia, Listeria)* 3
- Hepatitis A and B 2
- Gastroenteritis viruses 2
- Spongiform encephalopathy - occurrence, symptoms, Preventive and control measures 1

SUGGESTED READING

1. Frazier W.C. 1995 **Food Microbiology** IV edition, New York: Mcgraw Hill Book Company.
2. James M jay 1996 **Modern food microbiology** IV edition, New Delhi: CBS publishers.
3. M.R. Adams and M.O. Moss, 2004 **Food Microbiology**, Second Edition, New Delhi: Panima Publishing corporation.

FOOD SCIENCE AND CHEMISTRY
PRACTICALS

Credits : 1 **Semester: II**
Subject code: FS18205 **No. of Practical hours: 30**

Objectives: To impart knowledge on analyzing various constituents of food
Outcome: The students will gain knowledge in analyzing the constituents of food

1.	Prevention of enzymatic Browning in foods	1
2.	Estimation of Chlorophyll	1
3.	Estimation of Carotenoids	2
4.	Estimation of Specific gravity of oils	2
5.	Estimation of Benzoic acid	2
6.	Estimation of crude fibre	2
7.	Gelatinization of starch and factors affecting it	2
8.	Estimation of Acid value,	
9.	Estimation of Peroxide value	2
10.	Estimation of Saponification value	
11.	Estimation of Iodine value	1

SUGGESTED READING

1. Sethi Mohini / Rao E. S. (2011). Food Science Experiments and Applications. Second edition .CBS Publishers, New Delhi.
2. M. Swaminathan (1979). Food Science and Experimental Foods. Ganesh and Co. Madras
3. Charley H (1982). Food Science. John Wiley and Sons, Inc., New York
4. Potter Norman and Hotchkiss JH (2007). Food Science. C.B.S. Publishers, New Delhi.
5. Sri Lakshmi B (1997). Food Science. Newage International, New Delhi.
6. Vashisht Meera (1998). Introduction to Food, Nutrition and Food Processing. Anmol Publication Pvt Ltd, New Delhi.
7. Yadav S (1997). Food Chemistry. Anmol Publication Pvt Ltd, New Delhi.
8. Vieira E (2010). Elementary Food Science (4 th ed.) Chapman Hall
9. Laxmi Lal (2010). Fruit Science: Objective Fundamentals, Agrotech Publishing.Department of Foods and Nutrition

NUTRITIONAL BIOCHEMISTRY
PRACTICALS

Credits : 1 **Semester: II**
Subject code: FS18206 **No. of Practical hours: 30**

Objectives

- To develop an understanding of the principles of biochemistry.
- To enable students to gain practical knowledge regarding the basic methods involved in analysis of different nutrients.

Outcome: The students will gain practical knowledge in analyzing different nutrients

1.	Usage of different types of glasswares in clinical chemistry	1
2.	Estimation of blood glucose	1
3.	Estimation of protein by Biurette method	1
4-7	Estimation of Ash (Minerals) a. Iron b. Calcium c. Phosphorous	7
8-11	Qualitative test for carbohydrates (Seliwanoff's test, Phenyl Hydrazine test,test for starch, Glycogen)	5

SUGGESTED READING:

1. Deb AC (2001). Fundamentals of Biochemistry. Published by New Central Book Agency, Calcutta.
2. Weil JH (1990). General Biochemistry (6 th ed.). Published by Wiley Eastern Ltd, New Delhi
3. Murray R, Rodwell V, Bender D, Botham KM, Weil PA, Kennelly PJ (2009).
4. Harper's Illustrated Biochemistry (28 th ed.) Published by McGraw-Hill Medical.
5. Conn EE and Stumpf PK, Bruening G and Doi RH (2006). Outlines of Biochemistry (5 th ed.). Published by Wiley India Pvt. Ltd.
6. Mahansan, R. (2009). Practical Biochemistry. Published by Vayau Edu
7. Hames BD and Hooper NM (2003). Biochemistry. (2 nd ed). Published by Viva books private limited, New Delhi, India
8. Sharma S (1993). Practical Biochemistry (1 st ed.). Published by Jaipur : Classic Publishing House.
9. Plummer D T (2008). An introduction to Practical Biochemistry (3 rd ed.). Published by Tata McGraw Hill.

MICROBIOLOGY
PRACTICALS

Credits : 1 **Semester : II**
Subject code:FS18207 **No. of Practical hours: 30**

Objective: To gain knowledge of microorganisms present in foods.

Outcome: Students will analyze, identify and differentiate various microorganisms present in food.

1. Introduction and Safety in the food microbiology laboratory 2
2. Preparation and sterilizationof media. 1
3. Identification of microbes by simple staining and Gram staining
4. Lactophenol Blue mounting of Fungi 1
5. Microbiological examination of fresh fruits, vegetables and spices. 2
6. Microbiological examination of canned foods (acidic and non-acidic foods) 2
7. Microbiological examination of bottled and aseptically packed beverages
8. water (MPN method for determination of coliform count) 2
9. Microbiological examination of flour, bread, cakes, sugar and cocoa confectionery products 2
10. Microbiological examination of meat, milk and their products 2
11. Methylene blue reductase test for quality of milk 1

SUGGESTED READING

1. Gustavo F Gutierrez , Lopez, Gustavo V Barbosa-Canovas. 2003 **Food Science and Food Biotechnology** New Delhi: CRC Press.
2. Bibek Ray 2003 ,**Fundamental Food Microbiology**, Third Edition, New Delhi: CRC Press.

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. FOOD SCIENCE, NUTRITION AND DIETITICS
THIRD SEMESTER
ACADEMIC YEAR 2021-22 BATCH 2021-24 (CBCS)

S. No	Part	Subject Code	Title of the Subject	Hours /Week	Duration of Exam (hrs)	Marks			Credits
						Internal	External	Total	
1	I	ES18001	Environmental Studies & Gender Sensitization (AECC-5)	3	3	40	60	100	3
2	I	G18FS1T	Principles of Food Science, Nutrition & Dietetics (GE-3)(ID)	2	3	40	60	100	2
3	I	FS18301	Food Safety & Toxicology (SEC-I)	4	3	40	60	100	4
4	II	FS18302	Food Science & Processing (Core-7)	4	3	40	60	100	4
5	II	FS18303	Clinical Biochemistry (Core-8)	4	3	40	60	100	4
6	II	FS18304	Nutritional Assessment & Surveillance (Core-9)	4	3	40	60	100	4
PRACTICALS									
7		G18FS1P	Principles of Food science, Nutrition & Dietetics (GE-3) (ID)	2	3	40	60	100	1
8		FS18305	Food Science & Processing (Core-7)	2	3	40	60	100	1
9		FS18306	Clinical Biochemistry (Core-8)	2	3	40	60	100	1

10		FS18307	Nutritional Assessment & Surveillance (Core-9)	2	3	40	60	100	1
	TOTAL			29	-	440	660	1100	25

*Ability Enhancement Compulsory Course (AECC) * Skill Enhancement Course (SEC)
*Generic Elective (GE) * Inter- disciplinary (ID)

ENVIRONMENTAL STUDIES & GENDER SENSITIZATION

Credits : 3 **Semester : III**
Subject Code: ES18001 **No. of lecture hours: 45**

Objectives:
- To understand the importance of ecological balance for Sustainable Development
- To understand the impacts of developmental activities and mitigation measures
- To understand the environmental policies and regulations.
- To develop students sensibility with regard to issues of gender in contemporary India
- To provide a perspective on the socialization of men and women
- To expose the students to debate on the politics and economic works and on gender violence

Outcomes:
CO1: Students will be able to understand the importance of Environmental education, conservation of natural resources & Understand the importance of ecosystems and biodiversity
CO2: Students will be able to understand the pollution problems and Apply the environmental science knowledge on solid waste management, disaster management
CO3: Students will be able to apply the environmental science knowledge to Improve the resources and Evaluate and understand the sustainable environmental conditions and control methods
CO4: Students will be able to identify the interactions and intersections of identities (e.g., gender, race, ethnicity, class, sexuality, and so on) and assess the ways in which they contribute to instances of privilege and power dynamics across cultures, space, and time. And their problems
CO5: Students will be able to Understand the gender problems and ways of addressing them, including interactions across local to global scales in communities and overcome inequalities with legislations

UNIT- I **9hrs**
NATURAL RESOURCES, ECOSYSTEMS, & BIODIVERSITY
- Definition, Scope and importance of environmental studies. Need for public awareness.
- Renewable & Non Renewable resources, Brief account on Forests, Water, Minerals and Energy (Solar, Wind, and Geo-thermal & Bio-energy).
- Definition of Ecosystem, Structure and functions—food chains, food webs, ecological pyramids, producers, consumers and decomposers.
- Energy flow and example ecosystems--- Forest, Desert, Aquatic ecosystems.
- Definition of Biodiversity, types (Genetic, Species, Ecosystem), India-mega diversity Nation.
- Hotspots, Threats to biodiversity, Conservation of biodiversity (In-Situ and Ex-Situ).

UNIT-II **9hrs**
ENVIRONMENTAL POLLUTION

- Definition of Environmental pollution
- Brief account of causes, effects, prevention and control measures of
  - (a) Air pollution
  - (b) Water Pollution
  - (c) Soil pollution
  - (d) Noise pollution
  - (e) Marine Pollution
- Solid Waste Management: Causes, Effects & Control measures of urban and industrial wastes
- Disaster Management: floods, Earth quakes, and Cyclones.

UNIT-III **9hrs Social**

Issues and Environment

- Rain-Water Harvesting, Water-shed Management, and From Unsustainable to Sustainable Development.
- Global Warming, Ozone depletion, and Acid rains
- Environmental Legislation: Air Act, Water Act, Environmental Protection Act, Forest Act, Wildlife Act.
- Environmental & Human Health---- HIV/AIDS
- Welfare Programs---- Family, Women & Child Welfare, Population Explosion
- Role of Information Technology in Environmental Studies.

UNIT-IV **9hrs**

Gender Studies

- Why should we study gender issues?
- Socialization- Making women and making men
- Being together as equals-Through the lens of gender
- Missing women: Gender selection and its consequences
- Health issues of Women

UNIT-V **9hrs**

Gender & Labour -Gender Violence & Law

- House work : The invisible labour- my mother doesn't work "share the load"
- Sexual harassment – say no eve teasing – the caste based violence – Nirbhaya Act
- Domestic violence - Is home a safe place? - Blaming the victim.-Domestic violence Act
- Forums of justice-Hindu Inheritance Act(2005)

Field Visit for Environmental Studies:

1. Visit to a local Polluted site- Industrial effluent plant/ Polluted Lake/

Agricultural Land
2. Visit to any Ecosystem

ESSENTIAL READING (for Gender Sensitization)

1. A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu. 201. **Towards a World of Equals : A Bilingual Text on Gender**. Hyderabad: Telugu Akademi.

SUGGESTED READING

(for Environmental Studies)

1. Rajagopalan R. 2015. **Environmental Studies-from Crisis to Cure.** Third Edition. Chennai: Oxford University Press.
2. Dr D K Asthana and Dr Meera Asthana. 2014. **A Text Book of Environmental Studies** Revised Edition. New Delhi: S. Chand & Company.
3. Anubha Kaushik and C.P. Kaushik Published. 2016. **Perspectives in Environmental Studies.** Fifth Edition. New Delhi: New Age International.

(for Gender Sensitization)

4. Sen Amartya **More Than One Million Women Are Missing.** New York Review of Books 37.20 (20 December 1990). Print. **We Were Making History...Life Stories of Women in the Telangana People's Struggle**. New Delhi: Kali for Women. 1998.
5. Tripti Lahiri. **By the Numbers: Where Indian Women Work. Women's Studies Journal .** *(*14 November 2012). Available online at: <http://blogs.wsj.com/ India real time/2012/11/14/by – the numbers-where-Indian-women-work/>
6. K. Satyanarayana and Susie Tharu. Ed. **Steel Nibs Are Sprouting : New Dalit Writing From South India, Dossier 2: Telugu and Kanada** Code=3732.
7. Vimala. **Vantillu (The Kitchen)". Women Writing in India: 600 Bc to the Present. Volume II.** The 20th Century. Ed. Suise Tharu and K.Laltitha. Delhi: Oxford University Press, 1995.599-601.
8. Shatrughna, Veena. **Women's Work and its Impact on Child Health and Nutrition.** Hyderabad: National Institute of Nutrition, Indian Council of Medical Research .1993.

PRINCIPLES OF FOOD SCIENCE, NUTRITION AND DIETETICS

Credits: 2 **Semester: III**
Subject Code: G18FS1T **No.of Lecture hours: 30**
Objective: To impart the knowledge of food science, nutrition and dietetics.
Outcomes:
CO1: The students will classify food in relation to health as a source of nutrition.
CO2: Students will identify various principles and methods of presentation.
CO3: Students will be able to create knowledge on energy value of foods.
CO4: Students will be able to identify various deficiency disorders due to imbalance of nutrition.
CO5: Students will be able to construct various diet plans.

UNIT-I
Introduction to Food Science **6Hrs**

- Definition of food and importance , classification of food in relation 2
  to health and as a source of nutrients. Objectives and importance of cooking. 2
  Preliminary preparations, processing and preservation. 2

UNIT-II
Principles and methods of preservation **6Hrs**

- Principles and methods of preservation. 3
- Preservation by high temperature, low temperature , syruping, brining, carbonation, preservation by chemicals, irradiation. 3

UNIT-III
Nutrition and nutrients **6Hrs**

- Basic definition of nutritions, health, nutrients, proximate principles. 2
- Classification of food based on nutritive value and functions. 2
- Energy value of foods and energy requirements. 2

UNIT-IV
Nutrients and deficiency disorders **6Hrs**
Importance of carbohydrates, proteins, lipids, vitamins and minerals. 4
Disorders due to deficiency or imbalance of nutrients. 4

UNIT-V **6Hrs**
Diet Planning
Explanation of various terms used in dietetics 2
Food guide and food group systems. 2
Principles in planning diets. 2

SUGGESTED READING
1.Meyer LJ (1989). Food Chemistry (1st ed.), New Delhi : CBS Publisher
2.Swaminathan M (1997). Food Science and Experimental Foods. Madras : Ganesh &Co.
3.Maney Shakuntala (1987).Foods, Facts and Principles. New Delhi: Wiley Eastern.

FOOD SAFETY AND TOXICOLOGY

Credits: 4 **Semester: III**
Subject code: FS18301 **No. of Lecture hours: 60**

Objectives:

- To provide orientation towards basic concepts of food safety and toxicology
- To orient students with the measures for safe food production at household and commercial level
- To study about the various food laws.

Outcomes:

CO1: The students will be able to understand the basic principle of food safety.
CO2: The students will be able to apply them knowledge of food laws for safe food production.
CO3: Students will be able to explain various toxicants associated with food.
CO4: Students will be able to identify the chemicals toxicant in foods at various level.
CO5: Students will be able to appraise microbial toxin associated with food, their occurrence, symptoms and preventive measures.

UNIT- I

Basic principles of Food Safety and personal hygiene **12 Hrs**

- Food contamination: concept and definition. Sources of contamination Components of hygiene, Personal hygiene, Food hygiene, Environmental hygiene, Unit hygiene. 4
- Methods of Sanitation and Hygiene: Sterilization and disinfection using heat and chemicals 4
- Waste product handling and control- Solid and liquid waste disposal. Control of infestation- Rodent control 4

UNIT- II

Food Safety Management System (FSMS) **12 Hrs**

- Good Practices/ PRPs - HACCP, GMP, GHP 4
- Management Element / System, Statutory and regulatory requirements, Communication 4
- Certification - HACCP, ISO 22000, FSSC 22000, FSSAI 4

UNIT- III

Introduction to Food Toxicology **12 Hrs**

- Importance of Food toxicology 2
- Determining Toxicity 2
- Dose Effect and Dose Response 2
- Biological Toxins and Adulterants in foods 6
  1. Naturally occurring toxins in foods
  2. Toxins from processed foods
  3. Seafood toxins
  4. Various and its testing food adulterants

UNIT- IV

Chemical Toxins **12 Hrs**

- Chemicals used for pest management during farming, storage and transportation (Pesticides) – Organo Chlorines, Organophosphates, carbamates 6
- Heavy metals – Cd, Pb, Ni, Hg, Tin 6

UNIT- V

Microbial Toxins–Occurance, Symptoms, Prevention **12 Hrs**

1	Cholera toxin	2
2	Botulinum toxin	2
3	Tetanus toxin	2
4	Toxin form E. coli (0157:H7)	2
5	Staphylococcus enterotoxin	2
6	Mycotoxins	2

SUGGESTED READING

1. FSSAI. (2006) Manual of Fodd safety management System, FSS 2006
2. Fernandes M and Rose A. (2013) Persistent Organic Pollutants and Toxic Metals in Foods. Elsevier Publication.
3. Deshpande S. S. (2013) Handbook of Food Toxicology ebook (Free Down Load)

FOOD SCIENCE AND PROCESSING

Credits: 4 **Semester: III**
Subject code: FS18302 **No. of lecture hours: 60**

Objectives:
- To impart knowledge pertaining to the basic properties of food groups
- To provide basic understanding of chemistry of food groups
- To provide basic understanding of principles involved in cooking of cereals, legumes, milk, fruits and vegetables and oils & fats.

Outcomes:
CO1: Students will be able to understand the principles involved in processing of various food grains.
CO2: Students will be able to evaluate various steps to eliminate antinutritional components in nuts and oil seeds.
CO3: Students will be able to identify various dairy processing method.
CO4: Students will be able to create an understanding on changes occurring in fruits and vegetables during maturation.
CO5: Students will be able to appraise the role of sugar in food preparation.

UNIT- I
Cereals and Cereal Products **12 Hrs**
- Wheat- Composition, classification, milling, milled products, types of flour, gluten, doughs and batter. 3
- .Bread – role of ingredients in bread making, Malting. 3
- Rice- Types of rice,composition, cooking methods,products and fermentation 3
- Corn and other millets. Starch-Sources,functional properties,gelatinization,factors affecting gelatinization, dextrinization,retrogradation 3

UNIT-II
Legumes, Nuts and Oilseeds **12 Hrs**
- Legumes and Pulses- Types, composition, milling, cooking, toxic materials (antinutrients), germination, fermentation, digestibility. 5
- Soyabean and soy products. 4
- Oilseeds and Nuts: Types, composition, processing and antinutrients 3

UNIT-III **12 Hrs**
Milk and Milk Products
- Milk-composition of milk and milk products. 4
- Processing, types of milk, uses in cookery. 4
- Effect of heat, enzymes, acid, salts on milk and its products. 4

UNIT-IV

Fruits and Vegetables **12Hrs**

- Fruits and Vegetables- structure, composition, classification 4
- Changes occurring during maturation, ripening, post-harvest and storage. 4
- Pigments, browning, pectin and its application in the food industry. 4

UNIT-V

Oils and Fats and Sugar **12 Hrs**

- Fats & Oils- types, composition, interesterification of fats, shortening value of fats and oils. 5
- Sugar-physical properties, functional properties, sources. 3
- Sugar manufacture, application in food preparation. Sweetening agents, artificial sweeteners and types of candies 4

CLINICAL BIOCHEMISTRY

Credits: 4 **Semester: II**
Subject code: FS18303 **No. of Lecture hours: 60**

Objectives:

- To develop an understanding of the principles of Clinical biochemistry
- To obtain an insight into the chemistry of major nutrients and physiologically important compounds
- To apply the knowledge of clinical biochemistry to human nutrition and dietetics.
- To enable students to gain practical knowledge regarding the basic methods involved in analysis of different nutrients

Outcomes:

CO1: Students will be able to create knowledge on chemistry and metabolism of protein.
CO2: Students will be able to evaluate various gastric function tests and endocrine disorders.
CO3: Students will be able to apply the knowledge of liver and kidney function tests and interpret the results.
CO4: Students will be able to identify the various cardiac function tests.
CO5: Students will be able to appraise the role of fluids, electrolyte and acid base balance.

UNIT-I

Nucleic Acids and Nucleoproteins–Chemistry and Metabolism **12Hrs**

- Chemistry and biological importance of nucleic acids Nucleoproteins 4
- Catabolism of purines, formation of uric acid and its relationship to Gout 4
- Protein biosynthesis – translation, transcription and post translation events 4

UNIT- II

Gastric Function Tests and Endocrine Disorders **12 Hrs**

- Gastric function tests and their interpretation 6
  a. Acute and chronic pancreatitis-indicators
  b. Pentagastrin test
  c. Malabsorption syndrome (Carbohydrate, amino acid and fat malabsorption tests)
  d. Stagnant gut syndrome
  e. Verner Morrison syndrome
- Endocrine disorders a. Pancreatic hormones b. Pituitary hormones 6
  c. Hormones of adrenal cortex and medulla d. Sex hormones
  e. Gut hormones

UNIT- III

Liver and Kidney Function Tests and Their Interpretations **12 Hrs**

- Liver function tests 6
  a. Clinico-biochemical aspects of jaundice (bile pigments, enzymes)
  b. Liver function Tests: plasma proteins, albumin, prothrombin and enzymes

c. Tests for detoxification aspects of liver

- Renal function tests 6

a. Role and function of kidneys
b. Composition of urine
c. Osmolality of urine and serum
d. Clearance tests, GFR and its importance
e. Methods to calculate GFR
f. Indicators to assess kidney function: urea excretion, creatinine excretion, microalbumininuria, urinary lipids and proteins

UNIT-IV **12Hrs**

Cardiac Function Tests and Their Interpretations

- Cardiac function tests: a. Biophysical tests- principles, ECG, Echocardiography 4
  Angiography, Blood pressure. Biochemical indicators-(i) Serum lipid profile and 4
  Apoproteins (ii) Cardiac bio-markers (CK, LDH, Serum Transaminases and Troponins) 4

UNIT- V

Clinico-Biochemical Aspects of Fluids, Electrolytes and Acid Base Balance **12Hrs**

- Composition of body fluids, fluid compartments and their distribution 3
- Mechanisms involved in water and electrolyte balance 2
- Role of Na+, K+, HCO3- and Cl- in electrolyte balance. 2
- Physiological buffer systems 2
- Role of carbonate, phosphate buffer systems and kidney in maintaining acid base balance 1
- Respiratory acidosis, alkalosis, metabolic acidosis and alkalosis 2

SUGGESTED READING

1. Harold Varley (2006). Practical Clinical Biochemistry (6th ed.). CBS Publishers and Distributors, New Delhi
2. Mukherjee KL (2010). Medical Laboratory Techniques – A procedure manual for routine diagnostic tests. Tata McGraw Hill Publishing Co. Ltd, New Delhi
3. Murray R, Rodwell V, Bender D, Botham KM, Weil PA, Kennelly PJ (2009).
4. Harper's Illustrated Biochemistry (28th ed.) (LANGE Basic Science) [Paperback] McGraw-Hill Medical, ISBN-10: 0071625917, ISBN-13: 978-0071625913
5. Deb AC (2001). Fundamentals of Biochemistry. Pub. New Central Book Agency, Calcutta
6. Mahansan, R. (2009). Practical Biochemistry. Publisher Vayau Edu.
7. Teitz NW (2006). Clinical Guide to Laboratory Tests (4th ed.). WB Saunders Company, London
8. Smith AF, Beckett GJ, Walker SW and Rae PWH (2003). Clinical Biochemistry (6^{th} ed.). Blackwell Science publications UK
9. Talwar GP and Srivastava LM (2002). Textbook of biochemistry and human biology. Third edition. Prentice Hall of India Private limited, New Delhi, India.

NUTRITIONAL ASSESSMENT AND SURVEILLANCE

Credits: 4 **Semester: III**
Subject Code: FS18304 **No. of Lecture hours: 60**

Objectives:
- To sensitize students to the principles, and methods for assessment of nutritional status
- To equip students to use and interpret various methods for assessing nutrition status
- To enable understanding of purpose and types of nutrition surveillance

Outcomes:
CO1: Students will be able to Construct knowledge on nutritional status assessment method.
CO2: Students will be able to Use dietary intake parameter to assess nutritional status.
CO3: Students will be able to Explain biochemical parameter to assess nutritional status.
CO4: Students will be able to Classify various nutritional surveillance system.
CO5: Students will be able to Describe type of nutritional surveillance appropriate to different situation.

UNIT-I
Nutritional status assessment methods **12Hrs**
- Overview of nutritional status assessment methods: Direct parameters- (anthropometry, clinical signs and symptoms, dietary assessment and biochemical parameters); ecological parameters – environment, Food prices, natural calamities 2
- Anthropometry measurements commonly used in public health (weight for age, weight for height & height for age, and indication 2
- Other measurements used in clinical settings BMI, Skin fold Thickness, Waist/ hip ratio, waist circumference Criteria used for determining normal & at risk levels 2
- Basis of introduction of new WHO growth standards for children, Implications of introducing new WHO child growth charts for nutrition assessment on prevalence of wasting, stunting and underweight rates 2
- Use of growth monitoring charts in communities and their advantages 2
- New WHO growth standards for Adolescents, implications of introducing new standards in school health program 2

UNIT-II
Assessment of nutritional status using Dietary intake Parameters **12Hrs**
- Comparisons between available dietary intakes methods and understanding their usage and limitations in different field situations: 24-hour diet recall method 4
- Food frequency method; weighed food inventory; food diaries, food composition methods etc. 4
- Understanding the new RDA and ADI's and concept and use of consumption unit in diet surveys (eg. NNMB) 4

UNIT-III

Assessment of nutritional status using Biochemical Parameters **12Hrs**

An overview of assessment of biochemical parameters for assessing changes in the level of nutrients and their metabolites in body tissues at different levels of nutrition, their interpretation, advantages and disadvantages:

a. Lipids (TG. LDL and HDL cholesterol and their ratios) 1
b. Carbohydrates (blood and urinary glucose) 1
c. Protein (serum protein, albumin, NEAA/EAA ratio, hydroxyproline index, urea/creatinine ratio, etc) 1
d. Iron (Hb, HcT, serum iron, transferrin, ferritin) 1
e. Vitamin A (serum retinol, carotene) 1
f. Vitamin D (serum alkaline phosphatase, calcium and phosphorous) 1
g. B-complex vitamins (urinary excretion) 1
h. Vitamin C (serum ascorbic acid, whole blood ascorbic acid) 1
i. Iodine (T3, T4, urinary excretion) 1
j. Sodium, potassium and chloride k. Fluoride 3

UNIT- IV

Nutritional Surveillance and Surveillance Systems **12Hrs**

- Understanding Nutritional Surveillance and its purpose 2
- Surveillance/reporting system used in ICDS program, its strength & weaknesses 2
- Newer initiatives taken by government to improve ICDS surveillance system. 2
- Definitions of terms used in nutritional surveillance 6
  a. Long term nutrition monitoring
  b. Evaluation of programmes impact
  c. Timely warning and intervention systems

UNIT-V

Nutritional Surveillance Systems **12Hrs**

- Types of nutritional surveillance appropriate to different situations 2
- Indicators and data sources from existing macro and micro systems 10
  of information in India (Origin, objectives, importance and their use in community nutrition) NNMB, NFHS, NSSO, ICDS, NSS, CENSUS, MICS CES etc Nutrition surveillance for action –cycle of triple A

SUGGESTED READING

1. Jelliffe DB, Jelliffe EP (1989). Community nutritional assessment. Oxford University Press, New Delhi.
2. Gopaldas T and Seshadri S (1987). Nutrition monitoring and assessment. Oxford University Press. Delhi.
3. Sachdev HPS, Choudhury P (Eds), (1994). Nutrition in children. Developing countryconcerns. Dept of Pediatrics. Maulana Azad College. New Delhi.

PRINCIPLES OF FOOD SCIENCE, NUTRITION AND DIETETICS
PRACTICALS
(GE Inter-disciplinary)

Credits: 1 **Semester: III**
Subject Code: G18FS1P **No. of Practical hours: 30**

Objective: To impart the knowledge of food science, nutrition and dietetics.

Outcome: The students will gain knowledge on various nutritional aspects of food.

1. Preparation of squash	2
2. Preparation of cordial	1
3. Dehydration of fruits and vegetables	2
4. Preparation of pickles	2
4-5 Preparation of jam and jellies	3
6. Preservation by chemicals	1
7-9 Preparation of nutrient dense foods	4

SUGGESTED READING

1.Meyer LJ (1989). Food Chemistry (1st ed.), New Delhi : CBS Publisher
2.Swaminathan M (1997). Food Science and Experimental Foods. Madras : Ganesh &Co.
3.Maney Shakuntala (1987).Foods, Facts and Principles. New Delhi: Wiley Eastern.

FOOD SCIENCE AND PROCESSING
PRACTICALS

Credits: 1 **Semester: III**
Subject code: FS18305 **No. Of Practical hours: 30**

Objectives:

- To provide basic understanding of principles involved in cooking of cereals, legumes, milk, fruits and vegetables and oils & fats

Outcome: The students will gain knowledge of the principles involved in processing of, legumes, milk, fruits and vegetables and oils & fats

1. Determination of gluten content from wheat flour
2-4. Gelatinization of starch and finding the gelatinization temperature in various starches (potato, wheat, corn, rice and arrow root starch).
5. Retrogradation of starch.
6. Measurement of specific gravity of milk.
7. Determination of fat content in milk by Gerbers centrifuge
8. Estimation of pectin content in fruits.
9. Determination of pH of various fruit juices
10. Preparation of hard boiled confectionery

SUGGESTED READING

1. Sethi Mohini / Rao E. S. (2011). Food Science Experiments and Applications.Second edition .CBS Publishers, New Delhi.
2. M. Swaminathan (1979). Food Science and Experimental Foods. Ganesh and Co.Madras
3. Charley H (1982). Food Science. John Wiley and Sons, Inc., New York
4. Potter Norman and Hotchkiss JH (2007). Food Science. C.B.S. Publishers, New Delhi.
5. Sri Lakshmi B (1997). Food Science. Newage International, New Delhi.
6. Vashisht Meera (1998). Introduction to Food, Nutrition and Food Processing. Anmol Publication Pvt Ltd, New Delhi.
7. Yadav S (1997). Food Chemistry. Anmol Publication Pvt Ltd, New Delhi.
8. Vieira E (2010). Elementary Food Science (4th ed.) Chapman Hall
9. Laxmi Lal (2010). Fruit Science: Objective Fundamentals, Agrotech Publishing

CLINICAL BIOCHEMISTRY
PRACTICALS

Credits: 1 **Semester: III**
Subject code: FS18306 **No. of Practical hours: 30**

Objectives:

- To enable students to gain practical knowledge regarding the basic methods involved in analysis of different nutrients

Outcome: The students will gain knowledge regarding chemistry of major nutrients and the basic methods involved in analysis of different nutrients.

1. Estimation of glucose in urine	1
2. Estimation of uric acid in urine	1
3. Determination of creatinine levels in urine	2
4. Estimation of albumin content in urine	2
5-8 Estimation of cholesterol levels in blood(Total, LDL, HDL,VLDL)	5
9. Determination of Triglycerides in blood	1

SUGGESTED READING

1. Harold Varley (2006). Practical Clinical Biochemistry (6th ed.). CBS Publishers and Distributors, New Delhi
2. Mukherjee KL (2010). Medical Laboratory Techniques – A procedure manual for routine diagnostic tests. Tata McGraw Hill Publishing Co. Ltd, New Delhi
3. Murray R, Rodwell V, Bender D, Botham KM, Weil PA, Kennelly PJ (2009). Harper's Illustrated Biochemistry (28th ed.) (LANGE Basic Science) [Paperback] McGraw-Hill Medical, ISBN-10: 0071625917, ISBN-13: 978-0071625913
4. Deb AC (2001). Fundamentals of Biochemistry. Pub. New Central Book Agency,Calcutta
5. Mahansan, R. (2009). Practical Biochemistry. Publisher Vayau Edu.
6. Teitz NW (2006). Clinical Guide to Laboratory Tests (4th ed.). WB Saunders Company, London

NUTRITIONAL ASSESSMENT AND SURVEILLANCE PRACTICALS

Credits: 1 **Semester: III**
Subject Code: FS18307 **No. of Lecture hours: 30**

Objectives: To equip students to use and interpret various methods for assessing nutrition status

Outcome: The students will gain knowledge on various methods of assessing nutrition status

1. Data collection for various anthropometric measurements for children infants and adults 4
    1. Weight, height
    2. BMI
    3. waist/hip
    4. MUAC
    5. Head circumference
    6. SFT
2. Development of tools for collection of dietary data using 24hDRM and FFQ, data collection, analysis, comparisons with RDA, calculation of consumption units and interpretation using the RDA (NIN, 2010) 4
3. Understanding the Clinical signs and symptoms for various nutritional deficiencies through field visits, power point presentations, videos: 4
    a. SAM/kwashiorkor
    b. Anemia
    c. VAD, Xerophthalmia
    d. IDD
    e. Water soluble vitamin B-Complex and ascorbic acid
    f. Zinc and other micronutrients

4. Preparing a critique of Nutrition surveillance data available in sources like NFHS – 3, NNMB reports 3

SUGGESTED READING

1. Jelliffe DB, Jelliffe EP (1989). Community nutritional assessment. Oxford University Press, New Delhi.
2. Gopaldas T and Seshadri S (1987). Nutrition monitoring and assessment. Oxford University Press. Delhi.

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. FOOD SCIENCE, NUTRITION AND DIETITICS
FOURTH SEMESTER
ACADEMIC YEAR 2021-22 BATCH 2021-22 (CBCS)

S. No	Part	Subject Code	Title of the Subject	Hours /Week	Duration of Exam (hrs)	Marks			Credits
						Internal	External	Total	
1	I	FS18401	Nutrition of Macro and Micronutrients (GE-4)	4	3	40	60	100	4
2	I	FS18402	Public Health Nutrition (SEC-II)	4	3	40	60	100	4
3	II	FS18403	Food Science and Sensory Evaluation (C-10)	4	3	40	60	100	4
4	II	FS18404	Food Preservation (Core-11)	4	3	40	60	100	4
5	II	FS18405	Applied Statistics (Core-12)	3	3	40	60	100	3
6	II	FS18406	Diet Therapy (Core-13)	4	3	40	60	100	4
PRACTICALS									
7	II	FS18407	Food Science and Sensory Evaluation (C-10)	2	3	40	60	100	1
8	II	FS18408	Food Preservation (C-11)	2	3	40	60	100	1
9	II	FS18409	Diet Therapy (Core-13)	2	3	40	60	100	1
	TOTAL			29	-	360	540	9000	26

* Skill Enhancement Course (SEC)
*Generic Elective (GE) * Discipline-specific (DS)

NUTRITION OF MACRO AND MICRONUTRIENTS

Credits:4 **Semester:** IV
Subject code: FS18401 **No. of Lecture hours**: 60

Objectives:

- To promote basic knowledge of micro-nutrients
- To enable the students to know about the factors affecting the availability and requirements of nutrients
- To promote understanding of common nutritional disorders due to imbalance of micro nutrients
- To promote an understanding of Applied Nutrition and newer concepts in nutrition

Outcomes:

CO1: The students will be able to differentiate between various fat soluble vitamins.
CO2: The students will be able to understand the importance and deficiencies of water soluble vitamins.
CO3: The students will be able to appraise the role of macro and micro minerals.
CO4: The students will be able to demonstrate the role of functional foods.
CO5: The students will be able to understand newer concepts in clinical and therapeutic nutrition

UNIT- I

Fat Soluble Vitamins	**12Hrs**
Vitamins A, D, E and K-Absorption, transport, storage, excretion, Functions	6
Deficiencies, Toxicity, Requirements, Measurement of status	6

UNIT- II **12Hrs**

Water Soluble Vitamins

Thiamin, Riboflavin, Niacin, Pyridoxine, Ascorbic Acid, Folic Acid, Cyanocobalamine	4
Absorption, transport, storage, excretion, Functions, Deficiencies, Toxicity	4
Requirements, Measurement of status	4

UNIT- III **12Hrs**

Macro and Micro Minerals

Calcium, Phosphorous, Iron, Iodine and Zinc	4
Absorption, transport, storage, excretion, Factors affecting bioavailability	4
Functions, Deficiencies, Requirements, Measurement of status	4

UNIT- IV **12Hrs**

Functional Foods/Nutraceuticals

- Functional Foods / Nutraceuticals: Definition 3
- Importance and criteria 3
- Summary and highlights of studies on functional foods and nutraceuticals 3
- Food product development for therapeutic purposes 3

UNIT-V **12Hrs**

Introduction to Newer Concepts in Clinical and Therapeutic Nutrition

- Introduction to Newer Concepts in Clinical and Therapeutic Nutrition: Gene nutrient interaction , Nutrient drug interaction, Genetically modified seeds / foods 4
- Energy production, Fuels for contracting muscles 3
- Nutritional requirements of exercise 3
- Other considerations, Ergogenic aids 3

SUGGESTED READINDS

1. Garrow JS, James WPT, Ralph A and James JPT (2000). Human Nutrition and Dietetics (10th ed.) (Paperback), Churchill Livingstone. ISBN-10: 0443056277, ISBN-13: 978-0443056277
2. Swaminathan M (2008). Essentials of Foods and Nutrition, Vol II. Bangalore Printing and Publishing Ltd, Bangalore
3. Bamji MS, Prahlad Rao N and Reddy V (2010). A Textbook on Human Nutrition. Oxford and IBH Publishing Co, New Delhi
4. Wildman (2007). Handbook of Neutraceuticals and Functional foods. CRC Press.
5. Schmial, M (2009). Essentials of Functional foods. Springer publications.
6. A Stuart Truswell, Prof. H Nuty, Otago Nzealm (2008). Essentials of Human Nutrition.
7. Geissler C (2009). Fundamentals of Human Nutrition. Churchill publication
8. Gibney MJ, Macdonald IA and Roche H (2010). Nutrition and Metabolism (2nd ed.), Wiley-Blackwell, ISBN: 978-1-4051-6808-3
9. Krause and Mahan (2008). Food Nutrition, Diet Therapy (12th ed.), London : WB Saunders Company
10. Sue Rodwell Williams (2009). Nutrition, Diet Therapy (9th ed.), London : WB Saunders Company.
11. Shils ME, Olson JA and Shike (2005). Modern Nutrition in Health and Disease (10th ed.), Vol. I. Philadelphia, Lea and Fiebiger.D e p a r t m e n t o f F o o d s a n d N u t r i t i o n 35
12. Mukherjee KL (2010). Medical laboratory techniques – A procedure manual for routine diagnostic tests (Vol III). Tata McGraw Hill Publishing Company Ltd, New Delhi
13. Sharma S (1993). Practical biochemistry.Classic Publishing House, Jaipur
14. Varley HC (1998). Practical Clinical Biochemistry (Vol I and II). Gulab Vazirani Publishers Pvt. Ltd, New Delhi
15. David T Plummer (2008). An introduction to Practical Biochemistry (3rd ed.). Tata McGraw Hill Publishing Co, New Delhi

PUBLIC HEALTH NUTRITION

Credits: 4 **Semester:** IV
Subject code: FS18402 **No. of lecture hours**: 60

Objectives:

- To develop appropriate knowledge, understanding and professional skills to practice as a Public Health Nutritionist
- To equip students for promotion of good health by applying evidence based actions to solve nutrition and health problems

Outcome:

CO1: The students will be able to understand the Concept of Public Health & Public Nutrition.
CO2: The students will be able to evaluate the key indicators used in public health.
CO3: The students will be able to assess the problem of under nutrition in India.
CO4: The students will be able to analyze indicators used to define various deficiency disorders.
CO5: The students will be able to understand misleading about nutritional facts on label and misinformation about nutrition

UNIT- I **12Hrs**

An Overview of Public Health/ Public Nutrition

- Concept of Public Health & Public Nutrition,
  Prevention as the major concern in public health/nutrition,
  Methods of prevention 4
- Definitions used in PH/PN- Public health approaches, Epidemiology,
  Health Promotion, Advocacy, Food security, Evidence based interventions and policies,
  vulnerable groups, Dual burden of mal nutrition, HDI, Poverty enumeration 4
- Determinants of Health and Nutrition 4

UNIT-II **12Hrs**

Demography in Public Health and Public Nutrition

- Concept of Demography, Growth rate, Census enumeration and its objectives,
  Census factsheets, their interpretation & implications 3
- Target population calculations- vulnerable age groups,
  projected population in life cycle 2
- Key indicators used in public health to monitor impact of health/ nutrition/development programs globally, including indicators used to measure Quality of Life (QOL) 3
- Morbidity – mortality rates (IMR, NMR, U5MR, MMR etc), Nutrition status related indicators (Maternal and Child nutrition related indicators) 2
- Education, water and sanitation related indicators 2

UNIT- III **12Hrs**

Under Nutrition

- The problem of under nutrition in India, its types &causes, consequences & vulnerable age groups 3
- The new WHO growth standards, its use and implications and classification to define mild, moderate & severe forms of various types of under-nutrition 3
- Indicators used to define a nutrition/ health problem as problem of public health significance with special reference to prevalence of underweight, wasting, stunting for declaring nutrition emergency 3
- Reasons for selection of above indicators & Population covere to measure these indicators 3

UNIT-IV **12Hrs**

Micronutrient Malnutrition

- The problem of Micronutrient malnutrition, namely vitamin A deficiency, iodine deficiency disorders and iron deficiency anemia in India, its causes, consequences & vulnerable age groups 4
- Indicators used to define various deficiency disorders as problems of public health significance with special reference to :
  a. Vitamin A deficiency (Bitot's spot, night blindness & corneal xerosis prevalence)
  b. Iron deficiency (Hb levels)
  c. Iodine deficiency disorders (Urinary excretion levels of iodine) etc 4
- Reasons for selection of above indicators & Population covered to measure these indicators 4

UNIT- V **12Hrs**

MDG/ SDG Goals & WHO Nutrition Targets

- Four Core Themes of the United Nations Millennium Development Goals 2
- Introduction to the specific MDGs/SDGs 2
- MDG global targets and indicators for MDG 1,4,5 & 6 & SDG's 2
- WHO Nutrition targets to be achieved by 2025 2
- Nutrition/ Health system & governance system in India 2
- PHN Team – Role of Public Health doctor/ Nutritionist in Health Promotion 1
- Misleading about nutritional facts on label and misinformation about nutrition 1

SUGGESTED READING

1. K. Park (2011).Text Book of Preventive and Social Medicine, 21 EDITION. Banarsidas Bhanot Publishers. Jabalpur. ISBN13: 9788190607995. 868 pages.
2. Lal S. (2009) Textbook of Community Medicine, CBS Publication
3. Tracking progress on child and maternal Nutrition UNICEF (2009)
4. International Institute for Population Sciences (IIPS) and Macro International. 2007. National Family Health Survey (NFHS-3), 2005-06: India: Volume I. Mumbai: IIPS.
5. Vir Sheila (2011). Public Health Nutrition in Developing Countries published by Woodhead Publishing India. ISBN-13: 9780857090041, ISBN-10: 0857090046

FOOD SCIENCE AND SENSORY EVALUATION

Credits: 4 **Semester: IV**
Subject Code: FS18403 **No of Lecture hours: 60**

Objectives:

- To impart knowledge pertaining to the basic properties of some food groups i.e. eggs, meat, fish and poultry, spices, condiments, beverages and sugar
- To understand different aspects of sensory science and evaluation and their application
- To provide basic understanding of principles involved in cooking eggs
- To understand different aspects of sensory science and evaluation & their applications

Outcomes:

CO1: The students will be able to understand the composition and cooking methods of egg,meat, fish and poultry.
CO2: The students will be able to classify spices and condiments.
CO3: The students will be able to appraise the nutritional aspects of beverages.
CO4: The students will be able to justify the need for fortification of foods.
CO5: The students will be able to gain knowledge on various food commodities and sensory evaluation

UNIT-I **12Hrs**

Eggs, Meat, Fish and Poultry

- Eggs- Structure, Composition and quality of eggs, functional properties and uses in cooking, egg foams and changes during cooking 3
- Meat-Classification, structure and composition, identification of meat cuts, factors affecting quality,tenderization of meat, cooking methods, gelatin -composition, properties and uses 3
- Fish: Types, preparation for cooking, spoilage, processing and preservation 3
- Poultry-Buying guide for poultry,steps involved in dressing, factors affecting quality and cooking methods 3

UNIT-II

Spices and Condiments, Dietary Fibre, and Leavening Agents **12Hrs**

- Definition and classification of spices, condiments & other flavoring agents. 3
- Active principles present in them. Classification, sources and nutritional significance of dietary fibre. 3
- Types of raising and leavening agents and its contribution. 3
- Raising and Leavening agents : Types, constituents, uses in cookery. 3

UNIT-III **12Hrs**

Beverages

- Beverages- tea, coffee, chocolate and juices - processing, cost and nutritional aspects. 6

- Other beverages-aerated beverages and juices. 6

UNIT-IV

Other Food Commodities **12Hrs**

- Other Food Commodities- Convenience foods: role, types, advantages, uses, cost and contribution to diet. 4
- Elementary idea of probiotics, prebiotics and organic foods 4
- Fortified foods 4

UNIT-V

Sensory Evaluation of Foods **12Hrs**

- Sensory Analysis: Definition, use of sensory analysis in product evaluation. 2
- Factors affecting acceptance – sensory, psychosocial, physiological 2
- Sensory characteristics of food sense of taste-classification, taste qualities, taste thresholds, Factors influencing sensory measurements. 4
- Type of sensory tests, Taste Panels: Selecting panelists, environment for sensory evaluation, 3
- Sample preparation, presentation, score cards and recording and reporting 1

SUGGESTED READING

1. Vaclavik. (2003). Essentials of Food Science. CBS Publishers, New Delhi. ISBN:9788181283498.
2. Sunetra Roday (2007). Food Science and Nutrition, Oxford University Press

FOOD PRESERVATION

Credits:4 **Semester: IV**
Subject Code:FS18404 **No.of Lecture hours: 60**

Objectives

- To teach the students basics of food preservation
- To appraise the students of the latest developments in the food preservation
- To prepare various food products using preservation techniques

Outcomes:

CO1: The students will be able to understand the importance of food preservation.
CO2: The students will be able to prepare various food products.
CO3: The students will be able to distinguish between low and high temperature preservation.
CO4: The students will be able to identify the latest developments in food preservation.
CO5: The students will be able to appraise the role of packaging in food preservation

UNIT- I **12Hrs**

Basic Concepts in Food Preservation

- Importance of food preservation 3
- Principles involved in preservation of foods 3
- Factors affecting growth of microorganisms 3
- Food laws and agencies 3

UNIT- II **12Hrs**

Principles and Preservation of Various Food Products

- Fruit juices, squashes and cordials 3
- Jams, jellies and marmalades 3
- Tomato products 3
- Chutneys and sauces 3

UNIT-III **12Hrs**

Preservation Methods

- Preservation by means of low temperature- freezing and deep freezing 3
- Preservation by means of high temperatures 3
- Drying, pasteurization, dehydration, smoking and curing 3
- Spray drying, Lyophilization, Vacuum packaging, Canning 3

UNIT-IV **12Hrs**

Other Preservation Methods

- Preservation using irradiation- UV and gamma radiations 3
- Preservation by brining, sugaring, inert gas-pickling, carbonation and syruping 3
- Preservation using chemical preservatives 3
- Preservation by fermentation-vinegar, alcoholic beverages 3

UNIT-V **12Hrs**

Role of Packaging in food preservation

- Preservation techniques in convenience foods: Some examples 4
- Role of packaging in food preservation 4
- Extruded products 4

SUGGESTED READING

1. Kulshrestha SK (1994). Food preservation. Published by Vikas Publishing House Pvt Ltd, New Delhi
2. Girdharilal, Siddhapa GB and Tandon BL (1986). Preservation of fruits and vegetables. ICAR, New Delhi
3. Kukade S and Bhave N and Mehta A (1994). Food preservation Manual. Dept of food and Nutrition, SNDT College of Home Science, Pune
4. Kalia M (2008). Food Preservation and Processing, Kalyani Nanjunda, India
5. Swamy (2008). Fruits and vegetable Technology, Process and Product Development. Published by Priyadarshini Prakashana, India
6. Jood S and Khetarpaul N (2009), Food Preservation. Published by Agrotech
7. Kalia M. (2010), Food Quality Management. Published by Agrotech
8. Arti Sankhla et al. (2011), Food Preservation: Principles and Practices. Published by Agrotech.

APPLIED STATISTICS

Credits: 3 **Semester: IV**
Subject code: FS18405 **No. of lecture hours:45**

Objective: To study the basic statistical techniques in relation to food analysis.

Outcome: The students will gain knowledge on basic statistical techniques
CO1: The students will be able to interpret the correlation between two variables.
CO2: The students will be able to develop the probability density function of transformation of random variables.
CO3: The students will be able to analyze hypothesis tests of means, proportions and variances using both one & two sample data sets.
CO4: The students will be able to explain t-test, chi-square test for independence of attributes and goodness of fit.
CO5: The students will be able to classify the analysis of variance of one-way and two-way classification.

Unit – I

● Review of measures of central tendency and measures of dispersion	**9Hrs**
● Correlation – types of correlation	1
● scatter diagram- Karl Pearson's coefficient of correlation	2
● rank correlation- non- repeated and repeated ranks - simple problems	1
● Regression lines- regression equations	1
● fitting of linear regression equation	2
● fitting of linear regression equation of Yon X and X on Y -Simple problems	2
(NOTE: Derivations not required. Applications/ Problems only)	

Unit-II **9Hrs**

● Random variables, Mathematical expectations	3
● Probability distribution(Binomial, Poisson and Normal)- their concepts	3
● Applications and problems	3
● (NOTE: Derivations not required. Applications/ Problems only)	

Unit – III **9Hrs**

● Sampling – types of sampling- purposive sampling	1
● random sampling and stratified sampling	1
● definition of null hypothesis- alternative hypothesis	1
● type- I error- Type II error- level of significance	1
● Test of significance for large samples	1
● test signification for single proportion	1
● test signification for difference proportion	1
● test signification for single mean- test signification for difference of means	1
● test signification for difference of standard deviation- simple problems	1
(NOTE: Derivations not required. Applications/ Problems only)	

Unit – IV **9Hrs**

- Exact samplings distributions (t,X^2, F) their concepts
- Chi- Square Test: Chi – Square Test for goodness of fit 2
- chi-square test for independence of attributes 1
- yate's correction 1
- T- test: - t- test for single mean 1
- t- test for two means 1
- paired t- Test 1
- t- test for significance of the correlation of coefficient 2

(NOTE: Derivations not required. Applications/ Problems only)

Unit – V **9Hrs**

- F-Test- analysis of variance- assumptions
- Analysis of Variance 2
- ANOVA in one way- classification 2
- two – way of classification 2
- simple problems 2

(NOTE: Derivations not required. Applications/ Problems only)

SUGGESTED READING

1. S.C. Gupthaand V.K. Kapoor, "Fundamentals of Mathematical statistics", sulthan /Chand & Sons, New Delhi.2002.
2. S.C. Gupthaand V.K. Kapoor, "Stastistical Methods", sulthan /Chand & Sons, New Delhi. 2000.
3. V.K.Kapoor "Problems and solution in statistics" 3rd edition sulthanchand & Sons, New Delhi. 2000.

DIET THERAPY

Credits: 4 **Semester**: IV
Subject code: FS18406 **No. of lecture hours**:60

Objectives:

- To provide knowledge and clinical information about various diseases that will be necessary for holistic management of these conditions
- To understand the role of diet in the management of various diseases and apply the same to patients
- To provide practical laboratory training in the preparation of special diets
- To adapt these diets to patients with various disorders

Outcomes:

CO1: The students will be able to deign different communication models.
CO2: The students will be able to apply the knowledge of Medical Nutrition Therapy for Enteral and Parenteral Nutrition.
CO3: The students will be able to understand the Upper and Lower GI Disorders.
CO4: The students will be able to assess acute and chronic infectious disease.
CO5: The students will be able to gain knowledge on Nutrition Therapy for Diabetes Mellitus

UNIT-I **12Hrs**

Patient counseling

- Communication and mass communication 2
- Models of communication, Approaches to communication 2
- Different media, their characteristics and use, Introduction to IEC 2
- Different counselling techniques, Stages of change: Transtheoretical model, BASNEF model 3
- Activities that facilitate behavior change, Intervention model for behavior change, Resistance behaviours and potential strategies to modify them 3

UNIT- II

Introduction and Medical Nutrition Therapy for Enteral and Parenteral Nutrition **12Hrs**

- Applications of principles of diet therapy: Tips for diet prescription, Dietetic care in hospital patients, Team approach to health care and assessment of patients needs 4
- Enteral Nutrition: Formula composition, Osmolarity, Complication and monitoring 4
- Parenteral Nutrition: Nutrition solutions, Refeeding Syndrome 4

UNIT-III

Medical Nutrition for the Upper and Lower GI Disorders **12Hrs**

- Disorders of oesophagus: gastroesophageal reflux and esophagitis, hiatal hernia 4
- Disorders of the stomach: indigestion and dyspepsia, gastritis and peptic ulcer diseases, characteristics and differences between gastric and duodenal ulcers 4
- Common intestinal problems: diarrhoea, constipation, steatorrhea, ulcerative colitis, irritable bowel syndrome, diverticular diseases 4

UNIT- IV **12Hrs**

Medical Nutrition Therapy for Metabolic Stress and febrile conditions

- Sepsis, Trauma 3
- Burn, GI tract surgery 3
- Pre and Post Operative Care 3
- Acute and chronic infectious disease 2
- Typhoid, Tuberculosis 1

UNIT-V

Medical Nutrition Therapy for Diabetes Mellitus **12Hrs**

- Pathophysiology of diabetes mellitus 2
- Secondary complications of diabetes mellitus 2
- Diagnostic and screening criteria 2
- Management of diabetes mellitus: Goals and outcomes of medical nutrition therapy/dietary management of diabetes mellitus, Non-pharmacologic treatments helping in the management of diabetes mellitus, Role of alternate sweeteners, Medications 3
- Hypoglycemia-Classification, symptoms, postprandial or reactive hypoglycemia, early alimentary and late reactive hypoglycemia, idiopathic hypoglycaemia 3

SUGGESTED READING

1. Antia, F.P. (2010). Clinical Dietetics and Nutrition (4thed.). Pharmamed
2. Srilakshmi B (2011). Dietetics (6thed.). Wiley Eastern Limited.
3. Krause and Mahan (2008). Food, Nutrition, Diet Therapy (12thed.). WB Saunders Company, London
4. Sue Rodwell Williams (2009). Nutrition, Diet Therapy (9thed.). WB Saunders Company, London
5. Skipper A (2009). Advanced Medical Nutrition Therapy and Practice. Jone & Barlett Publishers
6. Nelms M (2007). Nutrition Therapy and Pathophysiology. Thomson publishers
7. Gropper S (2009). Advanced Nutrition and Human Metabolism (5thed). Cengage publishers
8. Shils M (2005). Modern Nutrition in Health & Disease (10thed). Lippincott publishers

FOOD SCIENCE AND SENSORY EVALUATION
PRACTICALS

Credits: 1 **Semester: IV**
Subject Code: FS18407 **No of Lecture hours: 30**

Objectives:
- To provide basic understanding of principles involved in cooking eggs
- To understand different aspects of sensory science and evaluation & their applications

Outcome: The students will gain knowledge on various food commodities and sensory evaluation

1-4. Egg and its applications 5

a. To study the effect of storage on the quality of eggs and determine the effect of temperature and time on cooking quality
b. Effect of acid and alkali on poaching of egg
c. To determine the effect of certain factors on the foaming power of egg
d. To use different egg foams in product preparation like soufflé

5-10 Sensory Evaluation 8

a. Threshold tests using sweet, sour, salty and bitter solutions (Sucrose, citric acid, NaCl and caffeine)
b. Preparation of molar solutions
c. Preparation of percent solutions
d. Preparation of sensory evaluation cards for: Discriminative tests (Quality tests and Rating tests) and Hedonic Scale
e. Conducting all the sensory evaluation tests in the laboratory, using suitable foods and evaluation cards

11. Detection of adulterants in foods 2

SUGGESTED READING

1. Vaclavik. (2003). Essentials of Food Science. CBS Publishers, New Delhi. ISBN: 9788181283498.
2. Sunetra Roday (2007). Food Science and Nutrition, Oxford University Press

FOOD PRESERVATION
PRACTICALS

Credits:1 **Semester:IV**
Subject Code:FS18408 **No.of Lecture hours: 30**

Objectives
- To teach the students basics of food preservation
- To prepare various food products using preservation techniques

Outcome: The students will gain knowledge on the latest developments in food preservation

Preparation of Various Food Products for Preservation

1. Preparation of Lemon squash 1
2. Preparation of Orange squash 1
3. Preparation of Papaya and apple jam 2
4. Preparation of guava jelly 1
5. Preparation of Orange marmalade 1
6. Preparation of Mixed vegetable pickle 1
7. Preparation of Lemon and green chillie pickle 2
8. Preparation of Tomato ketchup 1
9. Other processing methods for food preservation a. Freezing of fruits and vegetables
    b. Drying of vegetables 2
    c. Reconstitution of dried vegetables 2
10. Visit to fruit and vegetable preservation Industry 1

SUGGESTED READING

1. Kulshrestha SK (1994). Food preservation. Published by Vikas Publishing HousePvt Ltd, New Delhi
2. Girdharilal, Siddhapa GB and Tandon BL (1986). Preservation of fruits and vegetables. ICAR, New Delhi
3. Kukade S and Bhave N and Mehta A (1994). Food preservation Manual. Dept o food and Nutrition, SNDT College of Home Science, Pune

DIET THERAPY
PRACTICALS

Credits: 1 **Semester:** IV
Subject code: FS18409 **No. of lecture hours:30**

Objectives:

- To understand the role of diet in the management of various diseases and apply the same to patients
- To provide practical laboratory training in the preparation of special diets
- To adapt these diets to patients with various disorders

Outcome: The students will gain knowledge on the role of diet in managing various diseases.

Planning and preparing diets for

1. Diarrhea	2
2. Constipation	2
3. Tuberculosis	1
4. Thyphoid	1
5. Diabetes mellitus	1
6. Peptic ulcer	1
7. Burns	1
8. GI tract surgery	2
9. Ulcerative colitis	2
10. Steatorrhoea	2

SUGGESTED READING

1. Antia, F.P. (2010). Clinical Dietetics and Nutrition (4thed.). Pharmamed
2. Srilakshmi B (2011). Dietetics (6thed.). Wiley Eastern Limited.
3. Krause and Mahan (2008). Food, Nutrition, Diet Therapy (12thed.). WB Saunders Company, London
4. Sue Rodwell Williams (2009). Nutrition, Diet Therapy (9thed.). WB Saunders Company, London
5. Skipper A (2009). Advanced Medical Nutrition Therapy and Practice. Jone & Barlett Publishers
6. Nelms M (2007). Nutrition Therapy and Pathophysiology. Thomson publishers
7. Gropper S (2009). Advanced Nutrition and Human Metabolism (5thed). Cengage publishers
8. Shils M (2005). Modern Nutrition in Health & Disease (10thed). Lippincott publishers

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
B.Sc. FOOD SCIENCE, NUTRITION AND DIETITICS
FIFTH SEMESTER
ACADEMIC YEAR 2021-22 BATCH 2021-24 (CBCS)

S. No	Part	Subject Code	Title of the Subject	Hours /Week	Duration of Exam (hrs)	Marks			Credits
						Internal	External	Total	
1	I	FS21501	Food Service Management (GE-5)	3	3	40	60	100	3
2	I	FS21502	Sports Nutrition (SEC-III)	4	3	40	60	100	4
3	II	FS21503	Food hygiene and Sanitation (Core-14)	4	3	40	60	100	4
4	II	FS12504	Medical Nutrition therapy (Core-15)	4	3	40	60	100	4
5	II	FS21505 A / FS21505 B	Quantity food service and production (DSE - 1) Food Product Development and Entrepreneurship (DSE - 1)	4	3	40	60	100	4
6	II	FS21506 A / FS21506 B	Maternal and Child Nutrition (DSE-2) / Geriatric Nutrition (DSE-2)	4	3	40	60	100	4
PRACTICALS									
7	II	FS21507	Sports Nutrition (SEC-III)	2	3	40	60	100	1
8	II	FS21508	Food hygiene and Sanitation (Core-16)	2	3	40	60	100	1
9	II	FS21509	Medical Nutrition therapy (Core-17)	2	3	40	60	100	1
	TOTAL			29	-	360	540	900	26

INSTITUTIONAL FOOD SERVICE MANAGEMENT(GE)

Credits :3 **Semester: V**
Subject code: FS18501 **No. of lecture hours:45**

Objectives

1. To gain knowledge of the types of food services institutions in India and understand the characteristics of related food service establishment.
2. To get familiarized with the principles of management.
3. To acquire details pertaining to establishment of food services.
4. To understand the characteristics of food.
5. To gain knowledge pertaining to formulation and standardization of recipes.

UNIT I

FOOD SERVICE INSTITUTIONS **9Hrs**

- Classification of food service institutions according to function: Profit oriented, service oriented and public health facility oriented. 3
- Types of menus- Al a carte, table d'hôte, cyclic and combination; Types of food service - Self-service, tray service and waiter-waitress service 3
- Management of personnel in food services organization- Recruitment, Induction, Employee facilities and benefits, Evaluation of performance 2
- Methods of food purchasing; Food cost – components and behaviour of cost, factors affecting cost 1

UNIT II

MANAGEMENT OF FOOD SERVICE ESTABLISHMENTS **9Hrs**

- Function of management: Managing, Planning, Organizing, Directing, Coordinating, Controlling and Evaluating 3
- Catering Management – Principles (basic guidelines) 2
- Tools of management – Tangible Tools and Intangible tools 2
- Management of resources – Natural environment, Work environment 2

UNIT III

ORGANISATION OF SPACE AND EQUIPMENT IN FOOD SERVICES ESTABLISHMENT **9Hrs**

- planning a layout for food service institutions, features to be considered in kitchen designing Kitchens 3
- Storage Space – Types of storage 2
- Factors to be considered while planning, Service Area – Location Structural designing and planning storage spaces Equipment – Classification of equipment 2
- Selection of equipment, Factors involved in selection of equipments, Care and maintenance of equipment 2

UNIT IV

FOOD MANAGEMENT	**9Hrs**
● Characteristic of food – Types of food	2
● Quality of food –Sensory quality and nutritional quality	2
● Food purchasing – Importance, Types – open market, formal, negotiated and wholesale	2
● Receiving and Food storage – Delivery methods, General guidelines for storing perishable and non-perishable foods	3

UNIT V

STANDARDISATION OF FOOD AND PATENT REGULATIONS	**9Hrs**
● Formulation and standardization of recipes	2
● Steps involved in formulation and standardization of recipes, Significance of food standardization	3
● Patent laws- Definition, Evolution of IPR Patent rights in India.	2
● Food product labelling - purpose and types, Food product labelling Regulations	2

REFERENCES

1. Catering Management – An Integrated Approach – MohiniSethi, SurjeetMalhan, 2nd edition, New Age International Publishers.
2. Food Hygiene and Sanitation – S Roday, Tata McGraw Hill Publishing Co. Ltd., 3rd reprint.
3. Institutional Food Management –MohiniSethi

FOOD QUALITY CONTROL AND TESTING(SEC)

Credits: 4 **Semester: V**
Subject code: FS18502 **No. of lecture hours: 60**

Objectives

1. To provide a basic understanding of quality control and practice in food companies.
2. To provide approaches to the planning and organization of a total quality control system.
3. To provide a basic acquaintance with quality assurance.
4. To knowledge pertaining to quality testing methods.
5. To understand external quality control activities.

UNIT I

QUALITY CONTROL IN FOOD INDUSTRY	**12Hrs**
● Food quality and its role in food industry	2
● Need of quality control	1
● Quality attributes: dominant and hidden attributes	2
● Factors influencing the food qualities: Soil, field practices, harvesting practices, procedures, packaging, transportation, storage, conditions, processing conditions, packaging and storage conditions of finished products.	5
● Recording and reporting of quality.	2

UNIT II

TOTAL QUALITY CONTROL AND QUALITY IMPROVEMENT	**12Hrs**
● Definition of TQC, Nature OF Total Quality Control	3
● Approaches of TQC, Role of management	3
● Quality improvement techniques (QIT) in food industry	3
● Quality Improvement Plans (QIP), Quality Control Circles (QCC)·	3
●	

UNIT III

QUALITY ASSUSRANCE	**12Hrs**
Quality assurance from farm to table	
● GHP	3
● GMP	3
● GAP	3
● SOP	3

UNIT IV

QUALITY TESTING METHODS **12Hrs**

- Different types of colour measuring instruments, different viscometers to measure viscosity, methods used to measure consistency, — 3 3
- Method to find shape and size of food and food products, measurement of Texture — 3
- Measurement of defects: Improving visibility by dilution, white background, colour differences, standardization of conditions, reference standards, counts and measures, isolation of defects by floatation, elution, electronic sorting, Internal defects. — 4
- odour testing, techniques — 2

UNIT V

EXTERNAL QUALITY CONTROL ACTIVITIES **12Hrs**

- Inspection- Preshipment inspection and inspection at the port of destination — 3
- Certification and quality marks — 3
- International and national audit companies and their QC assessment protocols for – a) Food Industries b) Hotels c) Hospitals — 4
- Testing laboratories. — 2

REFERENCES

1 Food Industry Quality Control System Clute M. CRC Press, 2008
2 Sensory Evaluation Practices Stone, Bleibaum and Thomas Academic Press, 2012
3 Sensory Evaluation Practices Taylor Academic Press, 2012
4 Measurement and Control in Food Processing Bhuyan CRC Press, 2006
5 Principles of Sensory Evaluation of Food Amerine MA, Pangborn RM & Rosslos EB Academic Press 1965

FOOD QUALITY CONTROL AND TESTING PRACTICALS

Credits: 2 **Semester: V**
Subject code: FS18507 **No. of lecture hours: 30**
Objectives:

1. To provide a basic understanding of quality control and practice in food companies.
2. To provide approaches to the planning and organization of a total quality control system.
3. To provide a basic acquaintance with quality assurance.
4. To knowledge pertaining to quality testing methods.
5. To understand external quality control activities.

1.	Measurement of colour by using Tintometer/ Hunter Colour Lab etc	1
2.	Chromatographic estimation of colour	1
3.	Development of a QC assessment protocol for a Food industry	1
4.	Visit to a food industry, QC assessment using the tool developed	1
5.	Report writing of the Food industry QC assessment	1
6.	Development of a QC assessment protocol for a hostel	1
7.	Visit to a food industry, QC assessment using the tool developed	1
8.	Report writing of the Food industry QC assessment	1
9.	Development of a QC assessment protocol for a Hospital	2
10.	Visit to a food industry, QC assessment using the tool developed	1
11.	Report writing of the Food industry QC assessment	1
12.	Market survey of products for certification and quality marks	2
13.	Report on importance of certifications and quality marks identified during market survey	1

REFERENCES

1 Food Industry Quality Control System Clute M. CRC Press, 2008
2 Sensory Evaluation Practices Stone, Bleibaum and Thomas Academic Press, 2012
3 Sensory Evaluation Practices Taylor Academic Press, 2012
4 Measur
ement and Control in Food Processing Bhuyan CRC Press, 2006
5 Principles of Sensory Evaluation of Food Amerine MA, Pangborn RM & Rosslos EB Academic Press 1965

DIET AND MEDICAL NUTRITION THERAPY(CORE)

Credits :4 **Semester: V**
Subject code: FS18503 **No. of lecture hours:60**

Objectives:

1. To make students aware of the type of diets that are prescribed by the dietitians and study the patient's response to them
2. To understand the modifications and nutritional care for weight management.
3. To learn various aspects of hypertension and cardiovascular diseases.
4. To provide knowledge on medical nutritional therapy of liver disorders.
5. To understand the medical nutrition therapy given during renal disorders.

UNIT- I

CONCEPTS OF DIET THERAPY **12Hrs**

- Therapeutic adaptation of normal diets 2
- Principles and classification of normal diets 2
- Routine hospital diets and feeding: regular diet, light diet, soft diet, fluid diet enteral feeding- tube feeding, parenteral feeding- central and peripheral. 8

UNIT- II

ENERGY MODIFICATIONS AND NUTRITIONAL CARE FOR WEGHT MANAGEMENT **12Hrs**

- Identification of overweight and obese- etiological factors contributing to obesity and prevention treatment- low energy diets, behavioral modifications Complications of obesity 6
- Underweight- etiology and assessment. Treatment- high energy diets Complications – anorexia nervosa, bulimia. 6

UNIT- III

MEDICAL NUTRITION THERAPY FOR HYPERTENSION AND CARDIOVASCULAR DISEASES **12Hrs**

- Types, risk factors, diagnosis and assessment. Consequence and complications of hypertension. 3
- Role of diet in management of hypertension and its complications; role of sodium in hypertension and use of salt alternatives, their composition and contra indications; long term effects if regular consumption 5
- Medical nutrition therapy for atherosclerotic/ ischemic heart disease- types and risk factors, role of diet, prevention strategies- control of risk factors and 4

lifestyle changes.

UNIT- IV

MEDICAL NUTRITION THERAPY FOR LIVER DISORDERS **12Hrs**

- Liver function- normal and deranged, role of diet in liver health 3
- Liver function tests and nutritional care in liver diseases 3
- Etiology, diagnosis and dietary management of viral hepatitis, cirrhosis and alcoholic liver diseases, hepatic encephalopathy, Wilson's disease 6

UNIT-V

MEDICAL NUTRITON THERAPY FOR RENAL DISORDERS **12Hrs**

- Etiology, symptoms and dietary treatment in glomerular nephritis, nephrotic syndrome, acute and chronic renal failure, dialysis or renal transplant, nephrolithiasis or renal calculi 8
- Renal function tests 2
- Dietary management of renal disorders and its complications 2

REFERENCE BOOKS

- Mahan,L.K.Arlin.M.T(1992) Krause's Food, Nutrition and Diet Therapy, 8th Ed.W.B.Saunders Company, London
- Williams S.R. (1989): Nutrition and Diet Therapy, 6th Ed. Times Mirror / Mosby College Publishing, St. Louis.
- Raheena Begum(1989) A Test Book of Foods, Nutrition and Dietetics, Sterling Publishers, New Delhi.
- Robinson, C.H., Lawler, M.R,Chenoweth, W,L, and Garwick A,E(1986) Normal and Therapeutic Nutrition, 17th Ed., Macmillan Publishing Co

DIET AND MEDICAL NUTRITION THERAPY PRACTICALS

Credits: 2 **Semester: V**
Subject code: FS18508 **No. of lecture hours: 30**

Objectives:

- To make students aware of the type of diets that are prescribed by the dietician's and study the patient's response to them.
- To understand the medical nutrition therapy given during the renal disorders.

Outcome:

- The students will gain knowledge on various aspects of disorders in the body and plan, prepare and display diets for various disorders.

Planning, preparing and display of diets for various disorders

1.	Peptic ulcer	1
2.	Gout	1
3.	Cancer	1
4.	Cirrhosis	1
5.	Wilsons disease	2
6.	Glomerular nephritis	2
7.	Nephrotic syndrome	2
8.	Dialysis	2
9.	Renal calculi	2
10.	Alcoholic liver disease	1

REFERENCE BOOKS

- Mahan,L.K.Arlin.M.T(1992) Krause's Food, Nutrition and Diet Therapy, 8th Ed.W.B.Saunders Company, London
- Williams S.R. (1989): Nutrition and Diet Therapy, 6th Ed. Times Mirror / Mosby College Publishing, St. Louis.
- Raheena Begum(1989) A Test Book of Foods, Nutrition and Dietetics, Sterling Publishers, New Delhi.
- Robinson, C.H., Lawler, M.R,Chenoweth, W,L, and Garwick A,E(1986) Normal and Therapeutic Nutrition, 17th Ed., Macmillan Publishing Co

QUANTITY FOOD PRODUCTION AND SERVICE (CORE)

Credits: 4 **Semester: V**
Subject code: FS18504 **No. of lecture hours:60**

Objectives

1. To know the types and variety of foods available in the markets.
2. To understand indenting and planning menus.
3. To provide exposure on quality control food production.
4. To learn various services and delivery of foods.
5. To understand financial management.

UNIT I

QUANTITY FOOD PRODUCTION	**12Hrs**
● Introduction to industrial, instituted welfare and transport catering	3
● Food purchase, selection and storage	3
● Food purchasing procedure, purchasing methods and selection of foods equipment, storage- dry and refrigerated	6

UNIT II

MENU PLANNING AND INDENTING	**12Hrs**
● Menu planning – principles, emphasis on quantity food production outlets	4
● Principles on indenting, quantities required for quantity food production	4
● Practical difficulties involved in indenting	4

UNIT III

MEAL PLANNING	**12Hrs**
● Construction and selection of recipes for quantity cooking	3
● Standardization of recipes	2
● Storage and use of leftover foods	2
● Quality control of food production- by preventing contamination, by identifying areas of food service and by monitoring health of person working in food servic	5

UNIT IV

DELIVERY AND SERVICE OF FOODS	**12Hrs**
● Food service systems: conventional, commissary, ready prepared, assembly service	3
● Types of service: self-service, tray service, waiter-waitress service, portable meals	3
● Types of food services: campus food service, food service in commercial restaurants, hotel food service, hospital food service, industrial food service, school food service	4
● Clearing and winding up after service, Customer relations	2

UNIT V

FINANCIAL MANAGEMENT	**12Hrs**
● Cost concepts	3
● Food cost control	3
● Book keeping	3
● Books of account	3

QUANTITY FOOD PRODUCTION AND SERVICE PRACTICALS

Credits: 2 **Semester: V**
Subject code: FS18509 **No. of lecture hours: 30**

OBJECTIVE:

- Introduction to quantity Food Production emphasizing regional Indian dishes, Indian breads and sweets.

OUTCOME:
On successful completion of this course learners will be able to:
1. Prepare assorted Indian foods in bulk quantities.
2. Demonstrate the techniques of preparation of dishes from states of India.
3. Incorporate the spices and condiments that are unique to each province.
4. Prepare Indian breads and their variations.
5. Create desserts with correct texture and consistency.

MENU – I
Plain Rice - Avial –Sambar-MeenVarathathu-Nenthra Kai Chips-Inji Puli Kari-ParippuVadai – Prathaman AttukalSoup-

MENU II
Plain Rice-Veechchu Parotta-Chettinadu Chicken Curry-Moolai Mutta Varuval UrundaiKuzhambu-Beetroot Karaporiyal-Curd Rice-Kesari

MENU – III
Tomato Bath-Kholapuri Mutton Masala-Potato Vadai-Chappathis-Jallebi

MENU - IV
Kichidi-Tomato Baingan Ambal-Dal Philani-Macher Jal-Loochi-GulabJamun

MENU - V
BisbellaHullianna-Baesserattu-Mysore Bonda-Manglore Fish Fry-Potato Fry-Appalam Mysore Pak

MENU – VI
Chicken Biriyani-Vegetable Biriyani-Baghara Baingan-Onion Raitha-SemiyaPayasam

MENU - VII
Jeera Pulao-Dhal Makhani -Aloo Capsicum-Fish Amritsari-Phulka-Beetroot Halwa

MENU – VIII
Coconut Rice-Ven Pongal-Meat ball curry-Cabbage and Carrot foogath-Curd rice-Rose cookies

MENU IX
Plain Rice Mutton Vindaloo-Ambiachi Dhal-Mix Vegetable Chilly Fry-Curd Rice-Bean, Kajoo& Coconut - Burfi

MENU – X
Chettinadu Mutton Biriyani-Cheruva-Kallu Dosa-Vadai Curry-Curd Rice KuzhiPaniyaram

MENU – XI
Mutter Pulao-Bhaturas-Peshawari Chole-Palak Ghost-Aloo Gobi-GajarkaHalwa

MENU – XII
Kachchi Biriyani-MirchiKaSalan-Nellore Mutton Curry-Kulcha-Double KaMeetha

MENU - XIII
Yakhni Pulao-Aloo Paratha-Mutton Do Piaza-Dal Palak-Phirnee

MENU - XIV
Ghee Bhat –Kachori-Doi Mach-Aloo Pos to-BaigunBhaja-RasogullaMENU - XV Tandoori Naan-Tandoori Murg-Sheek Kabab-Paneer Tikka-Tandoori Pomfret

- 20 quantity food production of the any 2 above menus with stress on Indian regional cuisine snack& industrial menus
- Calculation of the cost involved for 20 packs (all overheads to be considered)
- Individual pricing of each meal
- Introducing various servicing technique by visiting the food outlets – A Report to be submitted

BASICS OF RESEARCH (DSE-1)

Credits: 4 **Semester: V**
Subject code: FS18505 **No. of lecture hours:60**
Objectives

1. To understand the significance of research methodology in Home Science research.
2. To understand the types of sampling and sampling designs.
3. To learn the knowledge of principles and purpose of research designs.
4. To know various research tools and methods of data collection.
5. To provide knowledge on coding and classification of data.

UNIT I
INTRODUCTION TO RESEARCH **12Hrs**

- Research meaning and objective 2
- Types- historical, descriptive, experimental, case study 2
- Significance of research and Measurement scales – nominal, ordinal, interval, ratio 2
- Variables – independent, dependent, intervening and Identification of a research problem 3
- Formulation of research questions, hypothesis and objectives 5

UNIT II
SAMPLING AND SAMPLING DESIGN **12Hrs**

- Population and sample, Sampling types- probability sampling (simple random, systematic random sampling), purposive sampling, stratified sampling, cluster sampling- advantages and disadvantages. 5
- Sampling bias and error, selection of adequate sample size 3
- Census and sample survey, steps in sampling design 2
- Criteria of selecting a sample procedure and characteristics of a good sample design 2

UNIT-III
RESEARCH DESIGNS **12Hrs**

- Basic principles of research design 2
- Purposes of research design: fundamental, applied and action, exploratory and descriptive, experimental, ex-post facto, longitudinal and cross-sectional, co-relational. 6
- Features of a good research design and true experimental design 2
- Quasi experimental design 2

UNIT-IV

RESEARCH TOOLS AND METHODS OF DATA COLLECTION **12Hrs**

- Quantitative research tools- mean, median and mode 2
- Qualitative research tools- focus group discussions, case studies, observations- direct and spot observations, in-depth interview 4
- Methods of data collection- observation, questionnaire- guidelines for constructing questionnaire, interview- guidelines for successful interview, scaling method, case study, home visits, advantages and disadvantages. 4
- Reliability and validity of measuring instruments 2

UNIT-V

ANALYSIS AND REPORT WRITING **12Hrs**

- Coding of data 3
- Classification and tabulation of data 3
- Diagrammatic representation of data 3
- Analysis and interpretation of data; preparation of data 3

REFERENCES

1. Edwards: experimental design in psychological research
2. Kerlinger: foundation of educational research
3. Bhandarkar P. L. and Wilkinson T.S. (2000), Methodology and techniques of research, Himalaya publishing house, Mumbai.
4. Bhatnagar G.L. (1900), Research methods and measurements in behavioral and social science, Agri Cole publishing agency, New Delhi.

FOOD PRODUCT DEVELOPMENT AND ENTREPRENEURSHIP (DSE-1)

Credits: 4 **Semester: V**
Subject code: FS18505 **No. of lecture hours:60**

Objectives

1. To acquaint the students with the principles of development of food products.
2. To enable the students to understand different steps involved in product development.
3. To make students understand the formulations of new products.
4. To know markets and various aspects of marketing.
5. To understand entrepreneurship and strategies of small-scale business.

UNIT I

INTRODUCTION TO FOOD PRODUCT DEVELOPMENT	**12Hrs**
● Basic principles and concepts of food product development	2
● Cultural approach to development of dietary pattern of various groups- linguistic, regional and religious (ethnic)	3
● Factors involved in food habitation and availability	3
● Importance and role of different research and development departments in food production industry	4

UNIT II

STEPS IN PRODUCT DEVELOPMENT	**12Hrs**
● Material resources based on market demand	3
● Standardization methods involved in product development	3
● Portion size and portion control, calculation of nutritive value and cost of production	3
● Shelf life and storage stability evaluation procedure of developed food products	3

UNIT III

TYPES OF NEW PRODUCTS	**12Hrs**
● Formulation of new food products for infants, preschool children, adolescents, pregnant and nursing mothers, old age and sports person	4
● Selection and training of judges	3
● Development of score card and analysis of data	3
● Role of advertisements and technologies in promotion of new products	2

UNIT IV

CONCEPT OF MARKET AND MARKETING	**12Hrs**
● Approaches of study marketing and marketing functions, market structure and marketing efficiency	3
● Role of government in promoting agricultural marketing	3
● Conditions for sale, license, identification and quality processing	3
● Studying the global market status, economic feasibility of new products	3

UNIT V

ENTREPRENUERSHIP	**12Hrs**
● Concept and definition of entrepreneurship	3
● Types of entrepreneurship, women entrepreneurship, growth, prospects and problems	4
● Small business: definition and composition of small business- economic contribution of small business	3
● Strategic planning for small business- steps in strategic planning	2

BOOKS RECOMMENDED

1. Orientation for Food Professionals, A Hand book – P V Suryaprakasa Rao.
2. Hand book of Analysis of Quality Control for Fruit and Vegetable Products – S Ranganna, 2nd edition.
3. Sensory Evaluation Techniques – Mcilgard, Civille, Carr, 3rd edition.
4. Indian Patents Law - Legal and Business Implications, Eds Ajith Parulekar, Saritha D'Souza.
5. The law of Intellectual Property Rights – Ed Shiv Sahai Singh.

ADVANCED NUTRITION (DSE-2)

Credits: 4 **Semester: V**
Subject code: FS18506 **No. of lecture hours: 60**

Objectives

1. To prepare students for understanding the management of pediatric nutrition.
2. To make student aware of latest happening in the field of geriatrics.
3. To make students understand the role of diet in management of lipidemia.
4. To understand the role of diet in cancers.
5. To learn dietary management in other conditions.

UNIT- I

MANAGEMENT OF PEDIATRIC MALNUTRITION	**12Hrs**
● Maternal nutritional status and birth outcome	3
● Importance of first 1000 days of life	3
● Management of low birth weight babies	3
● Management of SAM, MAM-WHO protocol	3

UNIT- II

NUTRITION FOR GERIATRICS	**12Hrs**
● Ageing- biology of ageing	2
● Drug, food and nutrient reaction	2
● Dietetics for geriatric care- nutritional requirement, food requirement, dietary modification	4
● Implication of ageing population for rehabilitation- demography, mortality and morbidity	4

UNIT -III

DIETARY MANAGEMENT IN HYPERLIPIDEMIA	**12Hrs**
● Types of lipidemia, classification	4
● Role of diet in the management of various types of hyperlipidemias	4
● Non- pharmacological treatment aiding diet therapy like exercise, lifestyle changes	4

UNIT IV

DIETARY MANAGEMENT IN CANCER	**12Hrs**

- Cancer – definition, types of etiological factors 3
- Role of diet in prevention of all types of cancers 3
- Nutritional management of cancer patients undergoing radiotherapy and chemotherapy 3
- Diet to be followed after treatment 3

UNIT V

DIETARY MANAGEMENT IN OTHER CONDITIONS **12Hrs**

- Etiology, causes, symptoms and nutritional management for bone disorders- osteoporosis, osteoarthritis, rheumatoid arthritis 4
- Etiology, symptoms and dietary management in HIV AIDS 4
- Diet therapy in allergy and food intolerance- lactose intolerance, fructose intolerance 4

REFERENCES

1. Bali, P.A(2001) care of the Elderly in India. Changing configurations, Indian Institute of Advanced study, Shimla
2. Bhai, L.T, (2002) Ageing on Indian perspective, Decent Books Pubs, New Delhi
3. Dietetics 5th edition by B. Srilakshmi
4. Singh. R. (1994) Educational and Vocational Guidance, Common Wealth pub, New Delhi

NEWER PERSPECTIVES IN PUBLIC HEALTH NUTRITION (DSE-2)

Credits: 4 **Semester: V**
Subject code: FS18506 **No. of lecture hours:60**

Objectives

1. To familiarize the students about monitoring NCD's and their risk factors.
2. To understand the policies and nodal sectors in India.
3. To learn various millennium development goals.
4. To know the role of nutrition in combating NCD'S.
5. To learn the strategies and interventions to reduce NCD's.

UNIT I

INTRODCUTION TO NCD's: AN EMERGING PUBLIC HEALTH PROBLEM IN DEVELOPING COUNTRIES	**12Hrs**
● Non communicable disease burden: global status, status in India	2
● Mortality, morbidity due to NCD and risk factors for NCD	2
● Monitoring NCD's and their risk factors, commonality of risk factors and their interrelationship	4
● National programme for prevention and control of diabetes, cardiovascular disease and stroke	4

UNIT II

POLICIES AND NODAL SECTORS CONCERNED WITH NUTRITION AND HEALTH	**12Hrs**
● Current national policies in India for improving nutritional and health status – nutrition, food and agriculture, health, population, education and development policies	6
● National: Nutrition Policy and plan of action	3
● Telangana State: Nutrition Policy and state plan of action	3

UNIT- III

DEVELOPMENT AND MANAGEMENT CONCEPTS	**12Hrs**
● Millennium development goals and its relation with nutrition	2
● Human development index (HDI): goals of human development and indicators used	3
● Human development index (HDI): Asia and India, hunger index: indicators and interpretation	3
● Copenhagen consensus: highlights and recommendations	2
● Lancet series with focus on 10 key interventions, management definitions, various approaches to management	2

UNIT-IV

THE ROLE OF FOOD AND AGRICULTURE SECTOR IN PREVENTING NCD'S **12Hrs**

- Improving food security by ensuring local food availability, consumers information — 2
- Improving the nutritional quality and safety of food, raising consumer awareness of food about healthy food and diets, sustainable food systems and diets — 4
- Role of nutrition in effectively preventing and combating non- communicable diseases — 2
- Foetal origins of adult diseases: implications of early undernutrition and long-term consequences — 2
- Rising double burden of malnutrition, child obesity (urbanization, reduced physical activity, changing dietary patterns, influence of industrialization). — 2

UNIT-V

STRATEGIES AND INTERVENTIONS **12Hrs**

- Strategies to reduce the risk factors for NCD's- crucial components of cost effective and feasible interventions, — 4
- Possible solutions and their costs, best buys interventions — 2
- Global initiatives to control NCD's — 6
  - Fruit and vegetable for health initiative
  - Nutrition in schools promoting lifelong healthy eating
  - Health promotion actions

B.Sc. FOOD SCIENCE, NUTRITION AND DIETITICS
SIXTH SEMESTER
ACADEMIC YEAR 2021-22 BATCH 2021-24 (CBCS)

S. No	Part	Subject Code	Title of the Subject	Hours /Week	Duration of Exam (hrs)	Marks			Credits
						Internal	External	Total	
1	I	FS21601A / FS21601B	Community Nutrition (DSE- 3) / Public Heath Nutrition (DSE-3)	3	3	40	60	100	3
1	I	FS21602A / FS21602B	Diet Counseling and Patient Care / Nutrition communication	4	3	40	60	100	4
PRACTICALS									
1	II	FS18603	Project Work	14	-	40	60	100	6
Total				**29**	-	200	300	500	21

NUTRITION FOR HEALTH OF WOMEN AND CHILDREN (DSE-3)

Credits: 5 **Semester: VI**

Subject code: FS18601 **No. of lecture hours: 75**

Objectives:

1. To learn the role of women in national development
2. To know the policies and programs for promoting maternal and child nutrition
3. To understand the health status of pregnant womens
4. To know the knowledge of physiology and endocrinology of lactation
5. To learn the etiology and management of malnutrition

UNIT-I

WOMEN IN FAMILY AND COMMUNITY **15Hrs**

- Role of women in national development 3
- Women in family and community 3
- Demographic changes menarche, marriage, fertility, morbidity, mortality, life expectancy, sex-ratio, aging and widowhood 4
- Women in society: women's role, their resource, contribution to family and effect of nutritional status 5

UNIT-II

WOMEN- HEALTH **15Hrs**

- Women and health facilities- women health 4
- Disease pattern and reproductive health 4
- Policies and programs for promoting maternal and child nutrition and health 4
- Concept of small family, methods of family planning- merits and demerits 3

UNIT-III

PREGNANT WOMEN- HEALTH AND NUTRITION **15Hrs**

- Importance of nutrition prior to and during pregnancy- prerequisites for successful outcome 3
- Effect of under nutrition for mother and child including pregnancy outcome and maternal and child health 4
- Physiology and endocrinology of pregnancy, embryonic and foetal growth and development 4
- Nutritional requirements during pregnancy: adolescent pregnancy, pregnancy and T.B., TUGR, gestational diabetes 4

UNIT-IV

PHYSIOLOGY AND HEALTH IMPLICATIONS IN LACTATING MOTHER **12Hrs**

- Development of memory tissue and role hormones, physiology and endocrinology of lactation 4
- Synthesis of milk component let down reflex, role of hormones. Lactation amenorrhea, effect of breast feeding on maternal health 3
- Human milk composition and factors effecting breast feeding. Human milk banking. Exclusive breast feeding 4
- Management of lactation: prenatal breast feeding, skill education. Rooming in problems- sore nipples, engorged breast and inverted breast 4

UNIT-V

CHILD HEALTH AND NUTRITION **12Hrs**

- Infant physiology- preterm and low birth weight infant- implication for feeding and management 4
- Growth and development during infancy, childhood and adolescents 4
- Feeding of infants and children and dietary management 4
- Malnutrition- etiology and management 3

EMERGENCY NUTRITION (DSE-3)

Credits: 5 **Semester: VI**
Subject code: FS18601 **No. of lecture hours: 75**
Objectives:

1. To know the need for medical nutrition therapy for feeding SAM children.
2. To understand the WHO protocol for management of SAM.
3. To make the students learn the experiences of SAM management through NRC's
4. To understand the use of RTE foods in management of SAM.
5. To know the role of nutrition in other emergencies.

UNIT I

SEVERE ACUTE MALNUTRITION (SAM): A SILENT NUTRITION EMERGENCY	**12Hrs**
● Severe Acute malnutrition, its definition, diagnosis and role of type 1 & type 2 nutrients in management of SAM, IAP consensus statement on the need for medical nutrition therapy for feeding SAM children	5
● Burden of: Global, Indian & various Indian states	3
● Consequences of SAM and its contribution to Infant & U5 mortality rates	3
● Weakness in current ICDS program to diagnose SAM at community level, Way forward	4

UNIT II

FACILITY BASED MANAGEMENT OF SAM	**12Hrs**
● Mechanism for Identification of cases for Facility Management	5
● Standard WHO protocol for Facility based management of SAM as given in F-IMNCI training protocol	5
● Composition of F75 & F 100 WHO formulas and indigenous locally used replacements of WHO formulas	5

UNIT III

NUTRITION REHABILITATION CENTERS	**12Hrs**
● Follow up mechanism to prevent relapse: Linkages between Community & Facility based management of SAM	5
● UNICEF supported best practices: Experiences of SAM Management through Nutrition rehabilitation centers (NRC'S) in high burden states	5
● Telangana Model: Creation of CDNC centers for SAM. Management: strengths & weaknesses & way forward	5

UNIT IV

COMMUNITY BASED MANAGEMENT OF SAM	**12Hrs**
● Integrated management of SAM by WHO protocol	4
● Appetite test for identification of SAM at the community level	4
● Use of Ready to use therapeutic food in management of SAM in community	3
● Composition of RUTF (Plumpynut) & its efficacy in promoting optimal weight gain at the household level intervention: Africa experience & way forward for India	4

UNIT V

ROLE OF NUTRITION IN OTHER EMERGENCIES	**12Hrs**
● HIV: Role of integrating nutrition in HIV treatment protocols	2
● HIV & Infant feeding, AFASS criteria for promotion of breast feeding or breast milk substitutes in HIV positive mothers', Role of counselor for giving options to mother to make an informed choice, Role of ART centers in India: strengths & weaknesses	7
● T.B.: Role of integrating nutrition in DOTS treatment protocols	3
● Role of nutrition interventions in malaria and other epidemics	3

REFERENCES

1. Infant Feeding Options in the Context of HIV (April 2004), The LINKAGES Project, Academy for Educational Development: E-mail: linkages@aed.org, Website
2. HIV & Infant feeding WHO recommendations-2004: linkagesproject.org
3. National guidelines and consensus on Management of SAM-2009 Indian Pediatrics, vol-47, 2010-Management of Acute Malnutrition
4. Acute Malnutrition-Situational Analysis in Rajasthan and MP. Action contrallae Faim-Action (Against Hunger)-2010
5. WHO- Child Growth Standards for SAM children- 2009
6. Community based Management of SAM-UNICEF-2009

7. WHO Guidelines for Inpatient treatment for SAM child-2003

COMMUNITY NUTRITION AND HEALTH EDUCATION (DSE-4)

Credits: 5 **Semester: VI**
Subject code: FS18602 **No. of lecture hours: 75**

Objectives:

1. To make students understand the responsibilities of nutritional counsellor.
2. To learn the national nutritional policies.
3. To know the concepts and components of food and nutrition security.
4. To understand various levels of health administration.
5. To learn the medical measures taken for employees.

UNIT-I

COMMUNICATION AND HEALTH EDUCATION **15Hrs**

- Communications- definition, process, types and barriers; tools and techniques of health education 4
- Audio aids, visual aids, their advantages and disadvantages 4
- Types of approaches- personal, group and mass: advantages and disadvantages 4
- Responsibilities of nutritional counsellor at community level 3

UNIT-II

POLICIES AND PROGRAMMES FOR IMPROVING NUTRITION AND HEALTH STATUS OF THE COMMUNITY **15Hrs**

- National nutrition policy, integrated child development services (ICDS) 4
- Mid-day meal program (MDMP) 3
- National program for prevention of anemia 4
- Vitamin A deficiency and iodine deficiency disorders 4

UNIT-III

FOOD AND NUTRITION SECURITY **15Hrs**

- Concept and components 3
- Determinants 4

- Approaches 4
- Overview of public sector programs for improving food and nutrition security 4

UNIT-IV

HEALTH ADMINISTRATION **15Hrs**

- Central level 3
- State level 4
- Village level 4
- Primary health care 4

UNIT-V

OCCUPATIONAL HAZARDS **15Hrs**

- Physical, chemical and biological protection of health and nutritional status of workers 5
- Women employees in industries and establishments 3
- Medical measures 3
- Infrastructure measures and legislation- the Factories Act and ESI Act 4

REFERENCES

1. Jelliffe D (1966) The assessment of Nutritional status of the community. Geneva. WHO.
2. Wadhwa A and Sharma S (2003). Nutrition in the Community-A Textbook. Elite Publishing House Pvt. Ltd. New Delhi.
3. Gibney MJ (2005). Public Health Nutrition. • Vir S. (2011) Public Health Nutrition in developing countries. Vol 1 and 2
4. ICMR (1989) Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
5. ICMR (2011) Dietary Guidelines for Indians – A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
6. Bamji MS, Krishnaswamy K and Brahmam GNV (Eds) (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
7. Text book of Preventive And Social medicine, K.Park, 19 th edition

FOOD PACKAGING (DSE-4)

Credits: 5 **Semester: VI**
Subject code: FS18602 **No. of lecture hours:75**

Objectives:

1. To impart comprehensive overview of the scientific and technical aspects of food packaging.
2. To install knowledge on packaging machinery, systems, testing and regulations of packaging.
3. To make students understand the packaging design and consumer behavior.
4. To impart knowledge packaging evaluation.
5. To learn the laws and regulations of food packaging.

UNIT I

INTRODUCTION TO FOOD PACKAGING	**15Hrs**
● Definition, functions and requirements for effective packaging	4
● Classification of packaging	4
● Primary, secondary and tertiary packaging	3
● Flexible, rigid and Semi- rigid packaging	4

UNIT II

PACKAGING MATERIALS AND METHODS	**15Hrs**
● Types of packaging material - glass, metal, plastics, paper, flexible laminates, bio-degradable, self-heating food packaging - uses, merits and drawbacks	3
● Packaging Methods and Performance a. Retortable plastic packaging b. Aseptic packaging c. Modified atmosphere packaging (MAP) d. Time-Temperature Indicators for food quality	7
● Storage and distribution – primary, secondary and tertiary containers, shipping containers	3
● Polymer Nanomaterials for food Packaging	2

UNIT III

PACKAGING DESIGN AND CONSUMER BEHAVIOUR	**15Hrs**
● Colors, graphic design, printing and labelling	5
● Consumer behavior purchase habits, motives	5
● Markets and prices	2
● Advertising – types, media and its role	3

UNIT IV

PACKAGING EVALUATION	**15Hrs**
● Packaging specification and control of packaging quality	4
● Shelf life theory	3
● Testing packaging materials (glass, flexible packaging materials)	5
● Food and food packaging interaction	3

UNIT V

FOOD PACKAGE LAWS AND REGULATIONS	**15Hrs**
● Environmental Consideration in Packaging	5
● Disposing of Food Packaging Material	5
● Food Package Laws and Regulations	5

REFERENCES

1. Sacharow, S., Griffin, R.C (2000). Food Packaging. AVI Publishing Company, West Port, Connecticut.
2. Davis, E.G (2004). Evaluation of tin & plastic containers for foods. CBS Publishers, New Delhi.
3. Cruess, W.V (2003). Commercial Fruit & Vegetable Products. Allied Scientific Publishers, New Delhi.
4. Potter, N. N, Hotchkiss, J. H (2000). Food Science. CBS Publishers, New Delhi
5. Raj, G.D. Encyclopedia of Food Science, Vol 2. Anmol Publications PVT Ltd, New Delhi
6. Clara Silvestri and Sossio Climmino (2013), Ecosystainable polymer nanomaterials for food packaging; Innovative solutions, characterization, needs, safety and environmental issues, CRC press.
7. Hand book of packaging by Paine and Paine

BASIC MATH (Bridge course)

Credits: **Semester:**
Subject code: **No. lecture hours:**
Objectives:

UNIT-I

- Number system-operations-factors-L.C.M- G.C.D - prime factorization- Divisibility rules

UNIT-II

- Equation-solution of an equation – graphical method-application of equation

UNIT-III

- Relation-types of relations-Functions-types of functions-examples

UNIT-IV

- Logarithm-definition-standard properties-small problems

UNIT-V

- Trigonometry basics-Standard trigonometric functions-Properties-simple problems

FOOD AS MEDICINE (self-learning course)

Credits: **Semester:**
Subject code: **No. lecture hours:**
Objectives:

1. To introduce the concepts of Ayurveda.
2. To impart knowledge on history and evolution of diets and raw foodism.
3. To understand the strategies of fasting and detoxification.
4. To learn various components of dietary treatment.
5. To know the review of various spices and herbs.

UNIT-I
INTRODUCTION TO AYURVEDA

- Introduction to ayurveda- What is food? Concept of quality
- The three doshas
- Six flavours, seasons and climate
- Food quantity, timing and food combination

UNIT -II
HISTORY AND EVOLUTION OF DIETS

- Practice of food- evolution and history of diet
- Paleolithic diet, ayurvedic diet, vegetarian diet and vegan diet
- Raw foodism and modern diets
- Cookware and preparation methods

UNIT-III
FASTING AND DETOXIFICATION

- Fasting and detoxification
- Theory and practice
- Methods and strategies
- Medicinal herbs as adjuncts

UNIT-IV
DIETARY TREATMENT

- Meal plans and strategic eating
- Food allergies
- Elimination of challenge diet
- Review of health issues and dietary treatment

UNIT-V
HERBS AND SPICES

- Review of 50 different herbs and spices
- Use of masalas
- Rubs and marinades

BAKING SCIENCE (add on course)

Credits: **Semester:**
Subject code: **No. of lecture hours: 20Hrs**

Objectives:

1. To know the common ingredients used in baking
2. To understand the various methods used to prepare breads.
3. To learn the procedure and packaging of biscuits.
4. To understand the cake mixing objectives and methods
5. To learn various aspects in preparation of wafers, frozen dough products.

UNIT-I
GENERAL INGREDIENTS FOR BAKERY PRODUCTS

- Ingredients: sources, functions, types of wheat flour, miscellaneous flours
- sources, functions, types of Shortenings
- sources, functions, types of Sweeteners and yeast
- Minor ingredients- oxidizing agents, salt, dairy and egg products, mold inhibitors, dough strengtheners/softeners and enrichment

UNIT-II
BREAD

- Bread making methods- straight and emergency dough methods
- Mixing and dough processing- functions of mixing and mixer types
- Thermal reactions keeping properties of bread and related products
- Bread spoilage and staling, factors and control measures

UNIT-III
BISCUITS, COOKIES AND CRACKERS

- Ingredients and their functions
- Preparation of biscuits- short dough biscuits, fermented dough biscuits, hard dough biscuits
- Biscuit baking, heat transfer mechanism, changes during baking
- Cooling, packaging and storage

UNIT-IV

CAKES

- Cake varieties, ingredients and their functions
- Formulations and formula balance
- Cake mixing objectives and methods
- Batter specific gravity, temperature, pH and baking reactions

UNIT-V

WAFERS

- Ingredients and their functions
- Frozen dough products
- Flat bread technology'
- Starches- sources, composition, properties, modification methods and applications in bakery industry

REFERENCES

1. Dubey, S.C. 2007. Basic baking 5th Ed. New Delhi: Chanakya Mudrak Pvt Ltd.
2. Raina 2003. Basic Food Preparation- A Complete Manual. 3rd Ed. Mumbai: Orient Longman Pvt Ltd.
3. Manay, S and Shadaskaraswami, M. 2004. Food Facts and Principles. New Delhi: New Age Publishers.
4. Barndt, R. L. 1993. Fat and Calorie – Modified Bakery Products. US: Springer
5. Faridi Faubin, 1997. Dough Rheology and Baked Product Texture. New Delhi: CBS Publications.