# SYLLABUS FOR
# UG COURSE IN BACHELOR OF SCIENCE IN NUTRITION UNDER NEP-2020

**CURRICULUM AND CREDIT FRAMEWORK FOR**

**UNDERGRADUATE PROGRAMMES (CCFUP)**

**[AS PER NEP, 2020]**

(With effect from - Session 2023-24 onwards)

# THE UNIVERSITY OF BURDWAN

BURDWAN, PURBA BARDHAMAN

WEST BENGAL, PIN-713104, INDIA

# COURSE COMPONENTS AND CREDIT DISTRIBUTION

| Semester | Name of the Course | | | | | | Total Credits | Full Marks |
|---|---|---|---|---|---|---|---|---|
| | Major/DS Course (MAJOR) | Minor Course (MINOR) | Interdisciplinary (IDC) | Ability Enhancement Course (AEC) | Skill Enhancement Course (SEC) | Common Value Added (CVA) Course | | |
| I | MAJOR 1 | MINOR 1 | IDC 1 | AEC 1 | SEC 1 | CVA 1 | 20 | 400 |
| II | MAJOR 2 | MINOR 2 | IDC 2 | AEC 2 | SEC 2 | CVA 2 | 20 | 400 |
| III | MAJOR 3 & 4 | MINOR 3 | IDC 3 | AEC 3 | SEC 3 | ----- | 22 | 375 |
| IV | MAJOR 5, 6 & 7 | MINOR 4 | -------- | AEC 4 | -------- | -------- | 21 | 350 |
| V | MAJOR 8, 9 & 10 | MINOR 5 | Internship (Food Industry / Beverage Industry / Rural Technology Centre / Biodiversity Centre/ Dietetics Department of Health Institution / Nutrition Rehabilitation Centre / Research Laboratory/ University Laboratory) | | | | 21 | 350 |
| VI | MAJOR 11, 12, 13 & 14 | MINOR 6 | ------- | ---------- | --------- | --------- | 20 | 375 |
| VII | MAJOR 15, 16, 17 & 18 | MINOR 7 | ------- | ---------- | --------- | --------- | 28 | 375 |
| VIII | MAJOR 19, 20, 21 & 22 | MINOR 8 | Without Research | | | | 22 | 375 |
| OR | | | | | | | | |
| VIII | MAJOR 19 | MINOR 8 | With Research (PROJECT WORK / DISSERTATION) (Instead of MAJOR 20, 21 & 22) | | | | 22 | 375 |
| Total | | | | | | | 174 | 3000 |
| Total Courses | 22 / 19 MAJOR | 8 MINOR | 3 IDC | 4 AEC | 3 SEC | 2 CVA | - | - |

*** 8 Minor courses & 3 Inter Disciplinary courses (IDCs) under Nutrition Honours curriculum is to be studied by students of other disciplines (Other than Nutrition Honours).**

*** Students of Nutrition Honours will have to study 8 Minor courses & 3 Inter Disciplinary courses (IDCs) from other discipline.**

# SEMESTER WISE BREAKUP

| SEMESTER - I | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits** | **Full Marks** | **Marks Division** | | |
| | | | | **Th.** | **Pr.** | **IA** |
| | | **L-T-P** | | | | |
| **Major/DS Course (MAJOR)** | **MAJOR 1: CONCEPT OF FOOD, NUTRITION AND HEALTH** | **4 (3-0-1)** | **75** | **40** | **20** | **15** |
| **Minor Course (MINOR)** | **MINOR 1: FOOD GROUPS, NUTRIENTS AND NUTRITION** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Multidisciplinary/ Interdisciplinary (IDC)** | **IDC 1: NUTRITION AND COMMUNITY HEALTH** | **3 (2-1-0)** | **50** | **40** | **-** | **10** |
| **Ability Enhancement Course (AEC)** | **AEC 1: $L_1$-1 MIL (Arabic/ Bengali/ Hindi/ Sanskrit/ Santali/ Urdu or Equivalent Course from SWAYAM or UGC recognized others)** | **2 (2-0-0)** | **50** | **40** | **-** | **10** |
| **Skill Enhancement Course (SEC)** | **SEC 1: DIABETES AND DIABETES MANAGEMENT** | **3 (2-1-0)** | **50** | **40** | **-** | **10** |
| **Common Value Added (CVA) Course** | **CVA 1: Environmental Science/ Education** | **4** | **100** | **60** | **20** | **20** |
| **Total** | | **20** | **400** | **-** | **-** | **-** |

| SEMESTER - II | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits** | **Full Marks** | **Marks Division** | | |
| | | **L-T-P** | | **Th.** | **Pr.** | **IA** |
| **Major/DS Course (MAJOR)** | **MAJOR 2: NUTRITION IN PHASES OF HUMAN LIFE** | **4 (3-0-1)** | **75** | **40** | **20** | **15** |
| **Minor Course (MINOR)** | **MINOR 2: HUMAN NUTRITION AND PHASES OF LIFE** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Multidisciplinary/ Interdisciplinary (IDC)** | **IDC 2: MATERNAL NUTRITION** | **3 (2-1-0)** | **50** | **40** | **-** | **10** |
| **Ability Enhancement Course (AEC)** | **AEC 2: L2-1 MIL (English or Equivalent. Course from SWAYAM or UGC recognized others)** | **2 (2-0-0)** | **50** | **40** | **-** | **10** |
| **Skill Enhancement Course (SEC)** | **SEC 2: PATHOLOGY AND LABORATORY TECHNIQUES** | **3 (2-1-0)** | **50** | **40** | **-** | **10** |
| **Common Value Added (CVA) Course** | **CVA 2** | **4** | **100** | **80/60** | **0/20** | **20** |
| **Total** | | **20** | **400** | **-** | **-** | **-** |

**Note:**

1. Skill based vocational course (addl. 4 Cr) during summer term for 8 weeks, who will exit the programme after securing 40 cr.
2. For UG Certificate 40 cr + Additional 4 cr (work based vocational course) = 44 cr. Students are allowed to re-enter within 3 years within the stipulated max. period of 7 years

| SEMESTER - III | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits** | **Full Marks** | **Marks Division** | | |
| | | **L-T-P** | | **Th.** | **Pr.** | **IA** |
| **Major/DS Course (MAJOR)** | **MAJOR 3: NUTRIENTS AND PHYSIOLOGICAL ASPECT** | **5 (4-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 4: NUTRITIONAL BIOCHEMISTRY** | **5 (4-1-0)** | **75** | **60** | **-** | **15** |
| **Minor Course (MINOR)** | **MINOR 3: NUTRIENTS AND ITS ROLE** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Multidisciplinary/ Interdisciplinary (IDC)** | **IDC 3: CHILD NUTRITION AND CHILD CARE** | **3 (2-1-0)** | **50** | **40** | **-** | **10** |
| **Ability Enhancement Course (AEC)** | **AEC 3: $L_1$-2 MIL (Arabic/ Bengali/ Hindi/ Sanskrit/ Santali/ Urdu] or Equivalent. Course from SWAYAM or UGC recognized others)** | **2 (2-0-0)** | **50** | **40** | **-** | **10** |
| **Skill Enhancement Course (SEC)** | **SEC 3: HEALTH CARE AND HEALTH EDUCATION** | **3 (2-1-0)** | **50** | **40** | **-** | **10** |
| **Common Value Added (CVA) Course** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Total** | | **22** | **375** | **-** | **-** | **-** |

| SEMESTER - IV | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits** | **Full Marks** | **Marks Division** | | |
| | | | | **Th.** | **Pr.** | **IA** |
| | | **L-T-P** | | | | |
| **Major/DS Course (MAJOR)** | **MAJOR 5: NUTRITIONAL PHYSIOLOGY-I** | **5 (4-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 6: PATHOPHYSIOLOGY AND DIET THERAPY-I** | **5 (4-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 7: PRACTICAL (BIOCHEMISTRY, PHYSIOLOGY AND DIET CHART PREPARATION)** | **5 (0-0-5)** | **75** | **-** | **60** | **15** |
| **Minor Course (MINOR)** | **MINOR 4: MEDICAL NUTRITION THERAPY** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Multidisciplinary/ Interdisciplinary** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Ability Enhancement Course (AEC)** | **AEC 4: L1-2 MIL (English or Equvlnt. Course from SWAYAM)** | **2 (2-0-0)** | **50** | **40** | **-** | **10** |
| **Skill Enhancement Course (SEC)** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Common Value Added (CVA) Course** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Total** | | **21** | **350** | **-** | **-** | **-** |

**Note:**

1. Skill based vocational course (addl. 4 Cr) during summer term for 8 weeks, who will exit the programme after securing 83 cr.
2. For UG Diploma 83 cr + Additional 4 cr (work based vocational course) = 87 cr. Students are allowed to re-enter within 3 years within the stipulated max. Period of 7 years.

| SEMESTER - V | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits** | **Full Marks** | **Marks Division** | | |
| | | **L-T-P** | | **Th.** | **Pr.** | **IA** |
| **Major/DS Course (MAJOR)** | **MAJOR 8: NUTRITIONAL PHYSIOLOGY-II** | **5 (4-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 9: PATHOPHYSIOLOGY AND DIET THERAPY-II** | **5 (4-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 10: FOOD SPOILAGE AND FOOD PRESERVATION** | **5 (4-1-0)** | **75** | **60** | **-** | **15** |
| **Minor Course** | **MINOR 5: FOOD SPOILAGE AND PRESERVATION METHOD** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Multidisciplinary/Interdisciplinary** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Ability Enhancement Course (AEC)** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Skill Enhancement Course (SEC)** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Common Value Added (CVA) Course** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Internship (for all students)** | | **2 (0-0-2)** | **50** | **-** | **Project - 30 + Viva - 20** | |
| **Total** | | **21** | **350** | **-** | **-** | **-** |

| SEMESTER - VI | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits** | **Full Marks** | **Marks Division** | | |
| | | | | **Th.** | **Pr.** | **IA** |
| | | **L-T-P** | | | | |
| **Major/DS Course (MAJOR)** | **MAJOR 11: FOOD MICROBIOLOGY AND FOOD-BORNE DISEASES** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 12: COMMUNITY NUTRITION** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 13: : FOOD SAFETY AND FOOD STANDARD** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 14: PRACTICAL (MICROBIOLOGY, NUTRITIONAL ANTHROPOMETRY AND DIET CHART PREPARATION)** | **4 (0-0-4)** | **75** | **-** | **60** | **15** |
| **Minor Course (MINOR)** | **MINOR 6: COMMUNITY NUTRITION** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Multidisciplinary/ Interdisciplinary** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Ability Enhancement Course (AEC)** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Skill Enhancement Course (SEC)** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Common Value Added (CVA) Course** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Total** | | **20** | **375** | - | - | - |

| SEMESTER - VII | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits** | **Full Marks** | **Marks Division** | | |
| | | | | **Th.** | **Pr.** | **IA** |
| | | **L-T-P** | | | | |
| **Major/DS Course (MAJOR)** | **MAJOR 15: NUTRACEUTICAL AND HEALTH** | **6 (5-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 16: FOOD PROCESSING TECHNOLOGY** | **6 (5-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 17: FOOD TOXICOLOGY AND IMMUNOLOGY** | **6 (5-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 18: EPIDEMIOLOGY AND DISEASE BIOLOGY** | **6 (5-1-0)** | **75** | **60** | **-** | **15** |
| **Minor Course (MINOR)** | **MINOR 7: NUTRACEUTICAL AND HEALTH** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Multidisciplinary/Interdisciplinary** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Ability Enhancement Course (AEC** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Skill Enhancement Course (SEC)** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Common Value Added (CVA) Course** | **NA** | **-** | **-** | **-** | **-** | **-** |
| **Total** | | **28** | **375** | **-** | **-** | **-** |

**Initiation of Research Project/ Dissertation**
**(Students who will continue Nutrition Honours with Research in Semester-8)**

| SEMESTER – VIII<br>(FOR UG HONS. WITHOUT RESEARCH PROJECT/DISSERTATION) | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits** | **Full Marks** | **Marks Division** | | |
| | | **L-T-P** | | **Th.** | **Pr.** | **IA** |
| **Major/DS Course (MAJOR)** | **MAJOR 19: BIOLOGICAL TECHNIQUES AND STATISTICS** | **6 (5-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 20: FOOD BIOTECHNOLOGY AND RURAL TECHNOLOGY** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 21: MOLECULAR BIOLOGY AND BIOINFORMATICS** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Major/DS Course (MAJOR)** | **MAJOR 22: PRACTICAL (BIOLOGICAL TECHNIQUES, BIOSTATISTICS AND COMPUTATIONAL BIOLOGY)** | **4 (0-0-4)** | **75** | **-** | **60** | **15** |
| **Minor Course (MINOR)** | **MINOR 8: FOOD BIOTECHNOLOGY AND RURAL TECHNOLOGY** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Total** | | **22** | **375** | **-** | **-** | **-** |

| SEMESTER-VIII<br>(FOR UG HONS. WITH RESEARCH PROJECT/ DISSERTATION) | | | | | | |
|---|---|---|---|---|---|---|
| **Course Name** | **Title of the Course** | **Credits**<br>**L-T-P** | **Full Marks** | **Marks Division** | | |
| | | | | **Th.** | **Pr.** | **IA** |
| **Major/DS Course (MAJOR)** | **MAJOR 19: BIOLOGICAL TECHNIQUES AND STATISTICS** | **6 (5-1-0)** | **75** | **60** | **-** | **15** |
| **Minor Course (MINOR)** | **MINOR 8: FOOD BIOTECHNOLOGY AND RURAL TECHNOLOGY** | **4 (3-1-0)** | **75** | **60** | **-** | **15** |
| **Research Project** | **PROJECT WORK / DISSERTATION** | **12** | **225** | **Seminar Presentation, Preparation & Submission of Research Project/ Dissertation - 135 + Viva - 90** | | |
| **Total** | | **22** | **375** | **-** | **-** | **-** |

# LIST OF MAJOR/DS COURSES (MAJOR)

| Semester No | Course No | Course Title |
|---|---|---|
| I | MAJOR 1 | CONCEPT OF FOOD, NUTRITION AND HEALTH |
| II | MAJOR 2 | NUTRITION IN PHASES OF HUMAN LIFE |
| III | MAJOR 3 | NUTRIENTS AND PHYSIOLOGICAL ASPECT |
| | MAJOR 4 | NUTRITIONAL BIOCHEMISTRY |
| IV | MAJOR 5 | NUTRITIONAL PHYSIOLOGY-I |
| | MAJOR 6 | PATHOPHYSIOLOGY AND DIET THERAPY-I |
| | MAJOR 7 | PRACTICAL (BIOCHEMISTRY, PHYSIOLOGY, DIET CHART PREPARATION) |
| V | MAJOR 8 | NUTRITIONAL PHYSIOLOGY-II |
| | MAJOR 9 | PATHOPHYSIOLOGY AND DIET THERAPY-II |
| | MAJOR 10 | FOOD SPOILAGE AND FOOD PRESERVATION |
| VI | MAJOR 11 | FOOD MICROBIOLOGY AND FOOD-BORNE DISEASES |
| | MAJOR 12 | COMMUNITY NUTRITION |
| | MAJOR 13 | FOOD SAFETY AND FOOD STANDARD |
| | MAJOR 14 | PRACTICAL (MICROBIOLOGY, NUTRITIONAL ANTHROPOMETRY, DIET CHART PREPARATION) |
| VII | MAJOR 15 | NUTRACEUTICAL AND HEALTH |
| | MAJOR 16 | FOOD PROCESSING TECHNOLOGY |
| | MAJOR 17 | FOOD TOXICOLOGY AND IMMUNOLOGY |
| | MAJOR 18 | EPIDEMIOLOGY AND DISEASE BIOLOGY |
| VIII (Without Research) | MAJOR 19 | BIOLOGICAL TECHNIQUES AND STATISTICS |
| | MAJOR 20 | FOOD BIOTECHNOLOGY AND RURAL TECHNOLOGY |
| | MAJOR 21 | MOLECULAR BIOLOGY AND BIOINFORMATICS |
| | MAJOR 22 | PRACTICAL (BIOLOGICAL TECHNIQUES, BIOSTATISTICS AND COMPUTATIONAL BIOLOGY) |
| VIII (With Research) | MAJOR 19 | BIOLOGICAL TECHNIQUES AND STATISTICS |
| | | PROJECT WORK / DISSERTATION (Instead of MAJOR 20, 21 and 22) |

# SEMESTER – I

## MAJOR 1: CONCEPT OF FOOD, NUTRITION AND HEALTH

### [TOTAL CREDITS: 4 (THEORY-3, PRACTICAL-1)]

## Course Outcome:

The students will have a basic concept on food, nutrition and health. The student will be able to understand the chemistry of food components like proteins, carbohydrates and lipids. They will have fundamental concept about various food commodities.

1. **Basic concept of Food, Nutrition and Health:**
   - Definition: Food, Nutrients, Nutritive value, Nutrition, Malnutrition, Undernutrition
   - Functions of food, Balanced Diet.
   - Food Groups, Food Pyramid, My plate
   - Concept of health and dimensions of health
2. **Cereals**, **Pulses and legumes:**
   - Nutritional aspects of wheat, rice and oat.
   - Types of pulses and legumes, uses, and nutritional aspects.
3. **Milk and milk Products**:
   - Composition and nutrients of milk
   - Nutritive value and Concept of milk processing and Pasteurization
   - Types of processed milk, milk products (butter, curd, paneer and cheese)
   - Probiotics in fermented milk products
4. **Egg**, **Fish and meat:**
   - Uses and nutritional aspects of edible fish, egg and meat, concept of red and white meat.
5. **Vegetables and fruits:**
   - Uses and nutritional aspect of commonly available vegetables.
   - Fresh fruits and dry fruits– raw and processed product.
6. **Salts**, **Fats and oils:**
   - Uses and nutritional aspects of various salts.
   - Types, sources, use and nutritional aspects of fats and oils.
7. **Beverages:**
   - Common types (tea, coffee and wines) and their uses, nutritional aspect.
8. **Food adjuncts and preserved products:**
   - Spices (Chilies, Turmeric, Garlic and Ginger), use and nutritional aspect.
   - Jams, Jellies, Pickles, Syrup, Squashes–uses and nutritional aspects.
9. **Methods of cooking:**
   - Dry, moist, frying and microwave cooking.
   - Effect of various methods of cooking on foods, nutrient losses in cooking.

**PRACTICAL:**

**Food Preparation:**

- Beverages (Milk shake / Lassi), Cereals (Fried Rice / Chapatti), Milk and milk products (Custard / Payasam) and Snacks (Poha / Sandwiches) [Any one from each category].
- Preparation of homemade ORS.
- Preparation of weaning foods for infants (Soup / Khichuri) [Any one].
- Preparation of low cost and medium cost school tiffin. [Any one item]
- Qualitative test for milk (Phosphatase test)
- Qualitative test for Vit-C (any fruit/ fruit juice)

**Suggested readings:**


- Hughes O, Bennion M (1970). Introductory Foods, Macrnillan& Co. New York.
- Lavies S (1998). Food Commodities.
- Pomeranz Y (Ed) (1991). Functional Properties of Food Components, (2nd edition), Academic Press, New York.
- Tindall HD (1983). Vegetables in the Tropics, MacMillan Press, London.
- Winton AL, Winton KB (1999). Techniques of Food Analysis. Allied Scientific Publishers.


# SEMESTER – II

## MAJOR 2: NUTRITION IN PHASES OF HUMAN LIFE

**[TOTAL CREDITS: 4 (THEORY-3, PRACTICAL-1)]**

## Course Outcome:

This course deals with actual requirement of an individual throughout the normal life span. Students obtain knowledge about the importance of breast feeding and weaning in infancy, childhood, adolescence and adulthood. Understanding the importance of additional nutritional demand during pregnancy and lactation and dietary management of Athletes and old aged people is essential for formulating an adequate diet for them.

1. **Concept and definition of terms:**
    - Growth, Development, Malnutrition and Health, Scope of Nutrition.
    - Growth monitoring and promotion-Use of growth charts and standards, Preventions of growth faltering.
2. **Minimum nutritional requirement and RDA:**
    - Formulation of RDA, dietary guidelines with reference to man and woman.
3. **Nutrition during infancy:**
    - Breast feeding, Formula feeding, Weaning, Supplementary foods, Nutritional management of Preterm baby.

4. **Nutrition for children:**
    - Diet in early childhood, elementary school age, high school age.
5. **Nutrition for adult: Male and female**
6. **Nutrition during pregnancy and lactation:**
    - Nutritional demands of Pregnancy, Food selection during Pregnancy, Complications of pregnancy and dietary management, Diet during Lactation.
7. **Nutrition for athletes:**
    - Nutritional requirements and dietary management for sportsman and athletes, Meal planning for athletes, Carbohydrate loading
8. **Geriatric nutrition:**
    - Planning of meals for older people, Nutrition of aged persons, Physiological complications in geriatric group and dietary modifications required, Oxidative stress and aging and role of antioxidative nutrients for preventing aging.
9. **Principles of meal planning:**
    - Food exchange list, Factors affecting meal planning and food related behavior.
    - Dietary guidelines for Indians.

**PRACTICAL:**

1. Growth chart: Plotting and Interpretation using primary or secondary data in accordance with both ICMR and WHO Chart.
2. Clinical assessment and sign of nutrient deficiency disorders: Protein energy malnutrition (PEM), Anaemia, Rickets, Goiter, Vitamin A, Vitamin C and Vitamin B complex (Slide/Photography).
3. Diet survey in accordance with ICMR method (at least 3 days).

**Suggested readings:**


- Hoar WS (1984). General and comparative Physiology. 3rd ed. Prentice-Hall of India.
- Indian Council of Medical Research (2003). Nutrient Requirements and Recommended-Dietary Allowance for Indians. New Delhi.
- Sherwood L (2004). Human Physiology: From cells to systems. 5th ed. Thomson Brooks Cole.
- Swaminathan M (2009). Essentials of Foods and Nutrition, Vols -1 and II. Ganesh and Co. Madras.
- Walker WA and Watkins JB (Ed.) (1985). Nutrition in Pediatrics, Boston, Little Brown & Co.
- WHO (1979). A growth chart for international use in Material and Children Health Care. Geneva.
- Wilson(1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.

# SEMESTER – III

## MAJOR 3: NUTRIENTS AND PHYSIOLOGICAL ASPECTS

**[TOTAL CREDITS: 5 (THEORY-4, TUTORIAL-1)]**

## Course Outcome:

The course deals with a complete understanding of dietary sources, daily requirement, physiological role and deficiency disorders of various macronutrients and micronutrients. Students learn the importance of energy balance and energy requirement throughout the lifespan. Knowledge is also imparted on the interaction of various nutrients with drugs

**1. Role of Macronutrients (Carbohydrates, Proteins & Lipids):**

- Definition, Classification, Structure, Physiological role, Dietary sources, Deficiency and excess disorders

**2. Role of Vitamins:**

- Fat soluble vitamins-Physiological role, dietary sources, deficiency and excess disorders.
- Water soluble vitamins- Physiological role, dietary sources, deficiency and excess disorders.

**3. Role of Minerals (Ca, P, Fe, Na, K, I, Zn, Mn, Mg, Co, Se):**

- Physiological role, dietary sources and deficiency and excess disorders.

**4. Dietary fibre:**

- Classification and nutritional significance of dietary fibre.

**5. Water:**

- Functions, Requirements, Concept of water balance.

**6. Energy in human nutrition:**

- Energy and its unit, Energy assessment and balance, Factors of energy requirement, BMR and its regulation, SDA of food**.**

**7. Nutrient and Drug Interaction:**

- Basic Concept, Effect of nutrition on drugs, Drug effects on nutritional status, Drug and drug interaction
- Clinical significance and risk factors for drug-nutrient interactions

**Suggested readings:**


- Gopalan C (1988). Nutritive value of Indian Foods. Indian Council of Medical Research.
- Guthrie AH (1986). Introductory Nutrition, 6th Ed. The C.V. Mesby Company.
- Indian Council of Medical Research (2003). Nutrient Requirements and Recommended-Dietary Allowance for Indians. New Delhi.
- WHO (1979). A growth chart for International use in Maternal and Children Health Care, Geneva.
- Winword(1988). Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.
- Swaminathan M (2009). Essentials of Foods and Nutrition, Vols -1 and II. Ganesh and Co. Madras.

**MAJOR 4: NUTRITIONAL BIOCHEMISTRY**
**[TOTAL CREDITS: 5 (THEORY-4, TUTORIAL-1)]**

## Course Outcome:

Student will be able to have coherent and systematic knowledge on carbohydrates, their types, carbohydrate metabolism, and role of various carbohydrates in relation to human health. They will be able to understand the lipids and fatty acids, lipid metabolism and their clinical importance. Students will be able to understand the enzymes, their types, enzyme activity and their industrial and diagnostic roles

1. **Basic properties of food:**
    - Food colour, Food pigments, Food flavour, Food texture, Sweetness and bitterness
2. **Food Carbohydrates:**
    - Classes of carbohydrate rich foods, Glycemic index (GI) and glycemic load (GL).
    - Properties and dietary importance of starch, sucrose, lactose, glucose and fructose.
    - Metabolism: Glycolysis, Tricarboxylic acid (TCA) cycle, Gluconeogenesis, Glycogenesis, Glycogenolysis and regulation of blood sugar level.
    - Role of carbohydrates: Gastrointestinal tract function, mineral metabolism, prevention and management of type 2 diabetes, Role of sugar alcohols
    - Disorders of carbohydrate metabolism: galactosemia, hereditary fructose intolerance, fructosuria and Glycogen storage disease (Von Gierke, Pompe, and Cori)
3. **Food Proteins:**
    - Protein rich foods, Biological importance of protein
    - Structural features of protein (alpha helix and beta pleated sheet)
    - Classes, chemical properties and functions (Hydration, Denaturation / Coagulation, Enzymatic reactions, Buffering, Browning)
    - Concept and definition: Complete and incomplete proteins, Biological value, Protein Efficiency Ratio (PER), Net Protein Utilization (NPU), Essential and non-essential amino acids.
    - Protein metabolism: Deamination, Transamination and Urea cycle.
4. **Food Lipids:**
    - Fat rich foods, Biological importance of lipids
    - Classes of lipids (Simple lipids, compound lipids and derived lipids), Properties and functions of fats, oils and fatty acids (MUFA, PUFA, SFA, TFA), Clinical importance of essential fatty acids (EFA)
    - Chemical reactions and functional properties of food lipids (Fractionation, hydrogenation, hydrolysis and hydrolytic rancidity, Interesterification, lipo-oxidation and polymerization).

- Lipid metabolism (Beta - oxidation of fatty acids).
- Lipoproteins: Types and clinical significance
- Cholesterol: Importance in human body, Factors affecting cholesterol in blood

5. **Enzyme:**
    - Classification, properties, enzyme kinetics (Michaelis-Menten equation), and factors affecting enzyme activity.
    - Brief idea on mechanism of enzyme action (Fischer Lock and key model) and preliminary concept of enzyme inhibition.
    - Use of enzymes in food industry
    - Clinical significance of enzymes (SGPT, SGOT, Creatine kinase & Alkaline phosphatase)

**Suggested readings:**


- Belitz HD.2005. Food Chemistry. Springer Verlag.
- Owen R. Fennema, 2006, Food Chemistry , Academic Press.
- Meyer LH. 1987. Food Chemistry. CBS publishers and Distributors, New Delhi.
- Potter, N. and Hotchikiss, J.H. (1996), Food Sciences, Fifth edition, CBS publishers and Distributors, New Delhi.
- Fennema OR.1996. Food Chemistry. Marcel Dekker
- Boyer R (2000). 3rd Ed. Modern Experimental Biochemistry. Person Education, Asia.
- Devlin TM (Ed) (2010). Textbook of Biochemistry with clinical correlations. 5th ed. Wiley-Liss.
- Murray RK, Granner P, Mayes A, Rodwell VW (2003). Harper's Illustrated Biochemistry. McGraw-Hill.
- Rodwell VW, Bender DA, Botham KM, Kennelly PJ and Weil PA. (2015) Harper's Illustrated Biochemistry. 30th ed. McGraw-Hill. Asia.
- Switzer RL, Garrity LF (1999). Experimental Biochemistry. WH. Freeman & Company.
- Nelson DL and Cox MM. (2017) Principles of Biochemistry. 7th ed. W.H. Freeman
- Voet D, Voet JG & Pratt CW (1999). Fundamentals of Biochemistry. Upgrade edition. John Wiley & Sons.
- Berg JM, Stryer L, Tymoczko JL and Gatto GJ. (2015) Biochemistry 8 th ed. W.H. Freeman.
- Wilson K and Walker J. (2000) Practical Biochemistry. 5 th ed. Cambridge University Press

# SEMESTER – IV

## MAJOR 5: NUTRITIONAL PHYSIOLOGY-I

**[TOTAL CREDITS: 5 (THEORY-4, TUTORIAL-1)]**

## Course Outcome:

Student will be able to understand the current state of knowledge about the functional organization (Digestive system, Circulatory and Cardiovascular system, and Respiratory system and Musculo-skeletal system) of the human body. They will be able to develop insight of normal functioning of all the organ systems of the body and their interactions.

1. **Body composition:**
   - Generalized structural makeup of human body
2. **Overview of cell Biology**
   - Structure and functions of animal cell with special reference to Plasma membrane (Fluid Mosaic Model), Mitochondria, Ribosome, Endoplasmic reticulum**.**
   - Nucleus (nuclear membrane, nuclear chromatin and nucleolus).
3. **Digestive system:**
   - Structure and functions of G.I. tract.
   - Structure and functions of Stomach, liver, gallbladder and pancreas.
   - Composition and function: Salivary juice, Gastric juice, Pancreatic juice, Bile juice and Intestinal juice.
   - Digestion and absorption of carbohydrates, Protein and fats
   - Gastrointestinal hormones
4. **Circulatory and Cardiovascular system:**
   - Blood and Plasma Protein -Composition and Function, Blood groups
   - Blood formation and factors controlling Erythropoiesis, Mechanism of blood coagulation.
   - Structure and functions of heart.
   - Cardiac cycle, cardiac output, Blood pressure and its regulation, Hypertension.
5. **Respiratory system:**
   - Structure of Lungs and gaseous exchange (oxygen and carbon dioxid**e** transport), Brief idea on Acclimatization.
6. **Musculoskeletal System:**
   - Formation and functions of muscles, bones and teeth (Brief idea)**.**

**Suggested readings:**


- Chatterjee CC (1988). Text Book of Physiology – Vol I& II.
- Chaudhuri SK (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
- GanongW.F.(2003)-Review of Medical Physiology.21st ed. McGraw Hill.
- Guyton AC, Hall JE (2000). Text book of Medical Physiology. 9th Ed. Prism Books (Pvt.) Ltd. Bangalore.
- Hadley ME (2000). Endocrinology. 5th ed. Pearson Education.

- Hoar WS (1984). General and comparative Physiology. 3rd ed. Prentice-Hall of India.
- Jain A. K (2014) Human Physiology for BDS(5th Edition), Publisher: Avichal Publishing Company; ISBN: 9788177394337
- MariebE.N(2001) Human Anatomy and Physiology(5th ed)Pearson Education ,Inc, publishing as Benjamin Cummings.
- Pal G.K and Pal Pravati (2016) Comprehensive Textbook Of Medical Physiology (2Vols) Publisher:Jaypee Brothers Medical Pub (P) Ltd. ) ISBN: 5551234080758;
- Tortora G.J and Grabowski S.R.(2000) Principles of Anatomy and Physiology.9th ed. John Wiley and Sons.Inc
- Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.
- West J.B.(1996): Physiological Basis of Medical Practice.12th Edition. B. I. Waverly Pvt. Ltd.
- Winword(1988): Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.


## MAJOR 6: PATHOPHYSIOLOGY AND DIET THERAPY-I

**[TOTAL CREDITS: 5 (THEORY-4, TUTORIAL-1)]**

## Course Outcome:

Students will have a basic idea about diet therapy and the role of a dietitian. Students will be able to comprehend the pathophysiology and diet therapy of commonly occurring diseases. They will be able to correlate physiology with various disorders (Gastro-intestinal and cardiovascular disorders), their pathogenesis and their dietary management.

1. **General ideas of diet therapy:**
   - Therapeutic adaptations of normal diet, Classification of therapeutic diets (Progressive diets – Normal, Soft, Clear and Full fluid).
2. **Dietitians and basic hospital diets:**
   - Types of dietitians and role of dietitian.
   - Nutritional adequacy of hospital diets, Basic concept and methods of (i) Oral feeding (ii) Tube feeding (iii) Parenteral feeding.
3. **Diets in febrile conditions, infections and surgical conditions.**
4. **Pathophysiology, clinical symptoms, diagnostic tests and dietary management of Gastrointestinal disorders/diseases:**
   - Gastro-intestinal tract diseases - Diarrhoea, Constipation, Irritable Bowel Syndrome, Inflammatory Bowel Disease, Diverticular disease, Flatulence, Peptic ulcer, Ulcerative Colitis, Hemorrhoids
   - Liver, gall bladder and pancreatic diseases- Viral hepatitis and Cirrhosis of liver, Cholelithiasis, Cholecystitis, Cholecystectomy, Pancreatitis
   - Malabsorption syndrome, eating disorders (Anorexia nervosa and Bulimia).

5. **Pathophysiology, clinical symptoms, diagnostic tests and dietary management of cardiovascular disorder/diseases:**
    - Brief review of lipoproteins (TC, TG, LDL, HDL, VLDL)
    - Hypertension
    - Atherosclerosis–etiology and risk factor.
    - Dietary care: ischemic heart disease, arteriosclerosis and hyperlipidemia.
6. **Pathophysiology, clinical symptoms, and dietary management of Osteoarthritis**

**Suggested readings:**


- Anderson L, Dibble MV, Tukki PR, Mitchall HS, and Rynbergin HJ. Nutrition in Health and Disease. 17th edition, JB Lipincott& Co. Philadelphia.
- Anita FP. Clinical Dietetics and Nutrition. Second Edition, Oxford University Press, Delhi.
- Davis J and Sherer K (1994). Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, WB Saunders Co.
- Escott-Stump S (1998). Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkinson
- Garrow JS, James WPT and Ralph A (2000). Human Nutrition and Diabetics, 10th Edition, Churchill Livingstone.
- Gibney MJ, Elia M, Ljungqvist & Dowsett J. (2005) Clinical Nutrition. The Nutrition Society Textbook Series. Blackwell Publishing Company
- Gibson SR. (2005). Principles of Nutritional Assessment. 2nd Edition. Oxford University press · Joshi YK. Basics of Clinical Nutrition. 2nd Edition. Jaypee Brothers Medical Publishers.
- Lee RD & Neiman DC. (2009). Nutritional Assessment. 5th Edition. Brown & Benchmark.
- Mahan, L. K. and Escott Stump. S. (2016) Krause's Food & Nutrition Therapy 14th ed. Saunders-Elsevier ·Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) Modern Nutrition in Health and Disease. 10th ed. Lipincott, William and Wilkins.
- Williams, S.R. (2001) Basic Nutrition and Diet Therapy. 11th ed. Times Mirror Mosby College Publishing

## MAJOR 7: PRACTICAL
## (BIOCHEMISTRY, PHYSIOLOGY, DIET CHART PREPARATION)
### [TOTAL CREDITS: 5 (PRACTICAL-5)]

**Nutritional Biochemistry:**

1. Qualitative tests for sugar (Molisch's test, Benedict`s test, Iodine test), non-reducing sugar (Hydrolysis test or Inversion test).
2. Qualitative tests for protein (Ninhydrin test and Biuret test).
3. Qualitative tests for lipid (Emulsification test, Saponification test).

**Physiology:**

1. Determination of pulse rate.
2. Determination of blood pressure by Sphygmomanometer (Auscultatory method).
3. Determination of Bleeding Time (BT) and Clotting Time (CT).
4. Detection of Blood group (Slide method).
5. Measurement of Haemoglobin level (Sahli`s method).
6. Total count (TC) of RBC, WBC and Platelets.
7. Differential count (DC) of WBC.
8. Identification with reasons of histological slides (Liver, Kidney, Small intestine, Stomach, Pancreas, Testis, and Ovary).

**Planning and preparation of Diet chart for the following diseases (Case specific):**

1. Ulcer
2. Liver cirrhosis
3. Hypertension
4. Fever
5. Diarrhoea
6. Osteoarthritis

# SEMESTER – V

## MAJOR 8: NUTRITIONAL PHYSIOLOGY-II

**[TOTAL CREDITS: 5 (THEORY-4, TUTORIAL-1)]**

## Course Outcome:

Student will be able to understand the current state of knowledge about the functional organization (Excretory system, Reproductive system, Nervous system and Endocrine system) of the human body. They will be able to develop insight of normal functioning of all the organ systems of the body and their interactions.

1. **Excretory system:**
    - Structure and function of skin.
    - Regulation of temperature of the body.
    - Structure and functions of kidney in special reference to nephron.
    - Physiology of urine formation.
2. **Reproductive system:**
    - Structure and functions of gonads, concept on menstrual cycle.
    - Brief idea of pregnancy, parturition, lactation and menopause.
    - Brief concept on spermatogenesis and Oogenesis process.
3. **Nervous System:**
    - Concept on sympathetic and parasympathetic nervous system.
    - Brief anatomy and functions of cerebrum, cerebellum, hypothalamus and neuron.
    - Concept on synapse and synaptic transmission.
4. **Endocrine system:**
    - Location, anatomy, functional morphology and hormones of pituitary, thyroid and adrenal gland.
    - Structure and functions of pancreas.

**Suggested readings:**


- Chatterjee CC (1988). Text Book of Physiology – Vol I& II.
- Chaudhuri SK (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
- GanongW.F.(2003)-Review of Medical Physiology.21st ed. McGraw Hill.
- Guyton AC, Hall JE (2000). Text book of Medical Physiology. 9th Ed. Prism Books (Pvt.) Ltd. Bangalore.
- Guyton AC (1985). Function of the Human Body, 4th Edition, W.B. Sanders Company, Philadelphia.
- Hadley ME (2000). Endocrinology. 5th ed. Pearson Education.
- Hoar WS (1984). General and comparative Physiology. 3rd ed. Prentice-Hall of India.
- Jain A. K (2014) Human Physiology for BDS(5th Edition), Publisher: Avichal Publishing Company; ISBN: 9788177394337

- Marieb E.N(2001) Human Anatomy and Physiology(5th ed)Pearson Education ,Inc, publishing as Benjamin Cummings.
- Pal G.K and Pal Pravati (2016) Comprehensive Textbook Of Medical Physiology (2Vols) Publisher:Jaypee Brothers Medical Pub (P) Ltd. ) ISBN: 5551234080758;
- Tortora G.J and Grabowski S.R.(2000) Principles of Anatomy and Physiology.9th ed. John Wiley and Sons.Inc
- Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.
- West J.B.(1996): Physiological Basis of Medical Practice.12th Edition. B. I. Waverly Pvt. Ltd.
- Winword(1988): Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.


## MAJOR 9: PATHOPHYSIOLOGY AND DIET THERAPY-II

**[TOTAL CREDITS: 5 (THEORY-4, TUTORIAL-1)]**

## Course Outcome:

Students will be able to comprehend the pathophysiology and diet therapy of various types of diabetes, obesity, renal diseases, inborn errors and food allergies. Students will be able to correlate physiology with these disorders, their pathogenesis and dietary management.

1. **Pathophysiology, clinical symptoms, risk factors, diagnostic tests and dietary management of Diabetes:**
   - Types of Diabetes (Type 1 diabetes, Type 2 diabetes, Gestational diabetes), Risk factors, Clinical symptoms and signs, Diagnosis (Oral glucose tolerance test, Urinary sugar, Blood glucose test, Glycosylated hemoglobin test), Complications (Hypoglycemia, Ketoacidosis, long term complications).
   - Diet in Diabetes.
   - Diabetes insipidus: etiology, complications and management
2. **Pathophysiology, clinical symptoms, risk factors, diagnostic tests and dietary management of Obesity:**
   - Weight Imbalances**:** Underweight, Overweight and Obesity.
3. **Pathophysiology, risk factors, clinical features, diagnosis and dietary management of Renal diseases:**
   - Renal diseases (Nephritis, Glomeurlonehiritis, Uremia, Kidney failure, Nephrosis, Nephrolitiasis).
4. **Inborn Error of Metabolism**
   - Lactose intolerance, Phenylketonuria (PKU) and Alkaptonuria, Maple Syrup Urine Disease, Tyrosinemia, Cystic fibrosis
5. **Food allergies:**
   - Food sensitivities (Hypersensitivity reaction)
   - Diagnosis and Management of food allergies
6. **Dietary management of Nutritional Anaemia, Burn, Gout, Cancer**

**Suggested readings:**


- Anderson L, Dibble MV, Tukki PR, Mitchall HS, and Rynbergin HJ. Nutrition in Health and Disease. 17th edition, JB Lipincott& Co. Philadelphia.

- Anita FP. Clinical Dietetics and Nutrition. Second Edition, Oxford University Press, Delhi.
- Davis J and Sherer K (1994). Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, WB Saunders Co.
- Escott-Stump S (1998). Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkinson
- Garrow JS, James WPT and Ralph A (2000). Human Nutrition and Diabetics, 10th Edition, Churchill Livingstone.
- Gibney MJ, Elia M, Ljungqvist&Dowsett J. (2005) Clinical Nutrition. The Nutrition Society Textbook Series. Blackwell Publishing Company
- Gibson SR. (2005). Principles of Nutritional Assessment. 2nd Edition. Oxford University press · Joshi YK. Basics of Clinical Nutrition. 2nd Edition. Jaypee Brothers Medical Publishers.
- Lee RD & Neiman DC. (2009). Nutritional Assessment. 5th Edition. Brown & Benchmark.
- Mahan, L. K. and Escott Stump. S. (2016) Krause's Food & Nutrition Therapy 14th ed. Saunders-Elsevier ·Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) Modern Nutrition in Health and Disease. 10th ed. Lipincott, William and Wilkins.
- Williams, S.R. (2001) Basic Nutrition and Diet Therapy. 11th ed. Times Mirror Mosby College Publishing
- World Cancer Research Fund & American Institute for Cancer Research (2007) Food, Nutrition, Physical Activity and the Prevention of Cancer- A Global Perspective. Washington E.D. WCRF.


## MAJOR 10: FOOD SPOILAGE AND FOOD PRESERVATION

**[TOTAL CREDITS: 6 (THEORY-5, TUTORIAL-1)]**

## Course Outcome:

This course helps the students to understand the mechanisms of food spoilage and deterioration of foods and its raw materials by microbial, chemical and physical means. Students gather elaborate knowledge on the basic principles of food preservation processes. It also explains the importance of food packaging to ensure good shelf life.

1. **Fundamentals of food spoilage:**
    - Classification of food based on pH.
    - Definition-shelf life, perishable and semi perishable foods, shelf stable foods.
    - Role of microorganisms in the spoilage of different kinds of food – cereal and cereal products, vegetables and fruits, fish and other sea foods, meat and meat products, milk and milk products.
2. **Preservation by low and high temperature:**
    - Heat preservation methods: Sterilization, Pasteurization and blanching.

3. **Preservation by removal of heat / Low temperature**:
    - Principle of freezing, changes occurring during freezing, rate of freezing
    - Types of freezing - slow freezing and quick freezing.
    - Cryopreservation and cryoprotectants, lyophilization, antifreeze proteins, frozen food storage and thawing.
4. **Preservation by Moisture control:**
    - Concept of drying and dehydration**,** differences between sun drying and dehydration (i.e. mechanical drying).
    - Factors affecting rate of drying, types of driers used in the food industry.
5. **Preservation by Irradiation:**
    - Units of radiation, kinds of ionizing radiations used in food irradiation.
    - Mechanism of action, concept of cold sterilization.
6. **Preservation by Salt, Sugar and Chemical Preservatives**
7. **Food Packaging:**
    - Concept, needs and classification of packaging.
    - Packaging materials, Methods of packaging.
    - Labelling and Bar Coding.

**Suggested readings**


- B. Srilakshmi, Food science, New Age Publishers, 2002.
- Meyer, Food Chemistry, New Age, 2004.
- Bawa. A.S, O.P Chauhanetal. Food Science. New India Publishing agency, 2013.
- Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004.
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010). Basic Food Preparation:A Complete Manual, Fourth Edition. Orient Black Swan Ltd.
- Manay S. and Shadaksharaswamy M (2002). Foods–Facts and Principles. Wiley Eastern Ltd.
- Potter H (1995). Food Science, 5th Edition. CBS Publishers & Distributors

# SEMESTER – VI

## MAJOR 11: FOOD MICROBIOLOGY AND FOOD-BORNE DISEASES

## [TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]

## Course Outcome:

Students will have a basic idea about microorganisms, their nature and the culture techniques of microbes. Student will be able to understand the nature of microorganisms involved in food spoilage, food infections and intoxications. They will also have knowledge on the beneficial role of microbes. They will be able to comprehend the principles of various preservation and control techniques. They will be able to understand microbial safety in various foods operations.

1. **Microorganism in food fermentation:**
    - Microorganisms involved in food fermentation and their role.
2. **Food contamination:**
    - Primary sources of food contamination
3. **Control of microorganisms:**
    - Physical and chemical methods used in sterilization and disinfection.
    - Uses of high and low temperature, dehydration, freezing, freeze drying, irradiation and use of preservatives.
4. **Structural organization of Bacteria, viruses, Prions and Viroids:**
    - Structure and function of Bacterial cell wall, Capsule, Peptidoglycan, Endospore, Flagella, Fimbriae, Pili and Plasmid
    - Basic concept of Virus, Viroid and Prions
    - **Lytic cycle:** Lytic cycle of bacteriophages
    - **Lysogeny:** Mechanism of lysogeny and Lysogenic control, induction
5. **Nutrition and culture of microorganisms:**
    - Microbial nutrition-Types of culture media, Methods of pure culture and sub culture. Composition and principles of: Nutrient Agar, MacConkey Agar, Triple-Sugar-Iron Agar, Pseudomonas Isolation Agar, Blood Agar, Mannitol Salt Agar
    - Bacterial growth, Extrinsic and intrinsic factors affecting growth.
6. **Food infections and food-borne diseases** (Causal agents, symptoms, mode of transmission, mode of action of toxin, prevention and management)
    - Bacterial food infections and food-borne diseases: Staphylococcal intoxication, Botulism, Salmonellosis, Shigellosis, Enteropathogenic *Escherichia Coli* induced Diarrhoea, food borne illness by *Clostridium Perfringens* and *Bacillus cereus*
    - Concept of aflatoxin intoxication.
7. **Antibiotic and chemotherapeutic agents:**
    - Sulfur drugs, Antibiotics and their classification, Mode of action

**Suggested readings**


- Frazier, W.C. (1988) Food Microbiology, Mc Graw Hill Inc. 4th Edition
- Prescott, Harley, and Klein's Microbiology, 8th edition, (2011), Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton, McGraw Hill International. ISBN-13:978 0071313674.
- Bailey and Scott's Diagnostic Microbiology, 12th edition (2007), Betty A. Forbes, Daniel F. Sahm and Alice S. Weissfeld; Mosby Elsevier Publishers, ISBN-13: 978-0808923640.
- Microbiology, 6th edition (1993), Pelczar, Chan and Krieg; McGraw Hill International, ISBN-13: 978-0070492585.
- Brock Biology of Microorganisms, 13th edition (2010), Michael T. Madigan, John M. Martinko, David Stahl and David P. Clark, Pearsons, Benjamin Cummings, ISBN-13: 978- 0321649638..
- YasmineMotarjemi and Martin Adams (2006), Emerging Food borne pathogen-Wood Head Publishing England.


## MAJOR 12: COMMUNITY NUTRITION

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

On completion of the course, students are expected to be able to understand the concept and purpose of nutritional status assessment in community setting. They will be able to explain nutritional concerns among vulnerable sections of the community and strategies to combat them. They will gain knowledge with regard to standard methods and techniques for assessing nutritional status. Students' will be familiar with the use of indices and indicators for screening and consequent identification of malnutrition in the community.

1. **Community and Population:**
    - Community and its types – Rural and Urban
    - Characteristics of Community and population
    - Demography: Concept, Factors affecting demography, Demographic cycle, Indian demographic history
    - Factors affecting health of the Community (Social, economical, political).
2. **Assessment of Nutritional Status and Surveillance:**
    - Nutrition Monitoring and Surveillance: Objectives, Components, Process and Uses.
    - Direct Nutritional status assessment of human groups - Anthropometric, Biochemical, Biophysical, Clinical and Diet survey methods.
    - Nutritional anthropometry: Need and importance, standard for reference techniques of measuring height, weight, head, chest and arm circumference, interpretation of these measurements. Use of growth chart.
    - Indirect assessment: Secondary sources of community health data.
    - Clinical Signs: Identifying signs of PEM, vitamin A deficiency and iodine deficiency, Interpretation of descriptive list of clinical signs.

3. **Community Water and Waste Management:**
    - Importance of water to the community
    - Water-borne disease: Cholera and typhoid (Causative agent, Symptoms and preventive measures)
    - Microbiological Examination of drinking water (MPN test)
    - Sources of safe drinking water, characteristics potable water
    - Sewage disposal and treatment.
4. **Surveillance systems and the role of Agencies and Organizations:**
    - Role of international and national organizations and agencies (WHO, FAO, UNICEF, World Bank, CARE, NIN, CFTRI, ICMR, ICAR).

5. **National Nutritional Intervention Programmes:**
    - Objective, Target group, Scheme details - Integrated Child Development Services (ICDS), Mid-Day Meal Programme (MDMP), Vit A prophylaxis programme, Anemia prophylaxis programme, Iodine deficiency disorders control programme.
    - Concept on public distribution system.

6. **Communication in Nutrition and Health Education:**
    - Types, process and media of communication.
    - Interpersonal, Group and Mass communication.
    - Importance and relevance of Information, Education and communication (IEC) in Nutrition and Public Health.

**Suggested readings:**


- Park K (2009). Park's Textbook of Preventive and Social Medicine, 20th Edition, M/s BanarasidasBhanot, Jabalpur.
- Gordis L (1996). Epidemiology, Saunders, Pennsylvania.
- Norell SE (1998): Workbook of Epidemiology. Oxford: University Press, New York.
- Owen AY and Frankle RT (1986). Nutrition in the Community, The Art of Delivering Services, 2nd Edition, Times Mirror/Mosby.
- Roday, S. (1999) Food Hygiene and Sanitation. 1st Edition, Tata McGraw Hill, New Delhi.
- Saha A, Shattock F, Mustafa T. Epidemology in Primary Health Care. The McGraw-Hill Companies.

## MAJOR 13: FOOD SAFETY AND FOOD STANDARD
**[TOTAL CREDITS: 6 (THEORY-5, TUTORIAL-1)]**

## Course Outcome:

Through this course students acquire knowledge about various types of Food additives, food adulterants and their health hazards. Understanding the concept of Food security and Food safety is essential for ensuring safe food handling practices and safe food storage. Information on various Food laws and regulatory authority is also imparted.

1. **Food Hazard:**
    - Concept and types (Physical, Chemical and Biological hazards).
2. **Risk Analysis Definitions Related To Food Safety**:
    - Risk assessment, Risk management, Risk communication
3. **Hygiene and sanitation in food service establishments**:
    - Cleaning agent, disinfectants, waste disposal, pest and rodent control, Importance of sanitation and hygiene in food, Kitchen hygiene, Employee's health, Food plant hygiene

4. **Food additive and food safety:**
    - Concept of food safety, factors affecting food safety.
    - Food safety measures: basic concept of HACCP
    - Safe food handling practices and storing food safely.
    - Food additives-various types and their effects on health.
5. **Food security:**
    - Concept of food security**,** factors affecting food security.
    - Technologies for food and nutrition security

6. **Food adulteration:**
    - PFA definition of food adulteration, adulterants in commonly consumed food items.
    - Common adulterants in food and their effects on health.
    - Common household methods to detect adulterants in food,
7. **Principle and Methods of detection**
    - Vanaspati in Ghee, Vanaspati in Butter
    - Khesari flour in Besan, Argemone oil in Edible oil,
    - Metanil yellow in Turmeric
8. **Food laws and regulatory authority:**
    - Prevention of Food Adulteration (PFA) Act.
    - Regulating authority-Codex Alimentarius, ISI, Agmark, Fruit Products Order (FPO), Meat Products Order (MPO), Bureau of Indian Standards (BIS), MMPO, FSSAI**.**
    - Importance of food labels in processed foods and nutritional labeling

**Suggested readings:**


- Gopalan C and Kaur S (Eds.) (1993). Towards Better Nutrition, Problems and Policies, Nutrition Foundation of India.
- Tovel AP (1984). Standardising Food Service for Quality and Efficiency. AVI Publishing Company INC.
- Dept. of WCD, Govt. of India. (1993): National Nutrition Policy.
- Food and Nutrition Board, Dept. of WCD, Govt. of India (1995): National Plan of Action on Nutrition.
- Roday S (1999). Food Hygiene and Sanitation, 1st Edition, Tata McGraw Hill, New Delhi.
- Diehl JF (1995). Safety of Irradiated Foods Marcel Dekker Inc, New York.
- Raheena Begum: A textbook of food, nutrition and dietetics Sterling Publishers, New Delhi.


## MAJOR 14: PRACTICAL
## (MICROBIOLOGY, NUTRITIONAL ANTHROPOMETRY, DIET CHART PREPARATION)

**[TOTAL CREDITS: 4 (PRACTICAL-4)]**

**Microbiology:**

1. Preparation of liquid (broth) and solid media, Slant and Stab.
2. Microbiological techniques: Pure culture technique-Spread plate, Pour plate and Streak plate; Staining-Simple stain, Differential stain (Gram stain).
3. Biochemical tests for characterization: Catalase, Nitrate-reduction, IMViC reaction (Indole production, Methyl red, Voges–Proskauer test and Citrate test).
4. Sugar fermentation test
5. Microbiological examination of milk (Methylene blue reduction test).
6. Preparation of sanitizer

**Nutritional Anthropometry:**

1. Anthropometric measurement of Weight for age, height for age, weight for height and its comparison with reference value.
2. Determination of BMI and comments on results.
3. Measurement of circumference of chest, upper arm, waist - hip ratio.
4. Measurements of fat using skin fold thickness.

**Planning and preparation of Diet chart for the following diseases (Case specific):**

1. Diabetes mellitus
2. Obesity
3. Renal diseases
4. Nutritional anaemia.
5. Gout.

# SEMESTER- VII

## MAJOR 15: NUTRACEUTICAL AND HEALTH

**[TOTAL CREDITS: 6 (THEORY-5, TUTORIAL-1)]**

## Course Outcome:

This course gives an insight into the recent discoveries in the field of Food and Nutrition especially Functional Foods and Nutraceuticals. It enlists the potential health benefits of common functional foods and nutraceuticals – like Prebiotics, Probiotics and Dietary Fibers. Knowledge is also imparted on the fundamentals of GM food, various methods to enhance the nutritional quality of food and nutraceutical enrich medicinal plants.

1. **Physical activity and health:**
   - Importance and benefits of physical activity
   - Physical Activity – frequency, intensity, time and type with examples
   - Physical Activity Guidelines and physical activity pyramid
2. **Nutraceutical and Health:**
   - Concept, classification, sources and importance of nutraceuticals.
   - Natural occurrence of certain phytochemicals- Antioxidants and flavonoids: omega–3 fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds.
   - Role of nutraceuticals on diabetes, obesity and cardiovascular diseases.
3. **Oxidative stress and Nutraceutical:**
   - Concept of oxidant and ROS, Antioxidant (Natural and synthetic)
   - Enzymatic and non enzymatic antioxidant
   - Oxidative stress and nutraceutical on oxidative stress.
4. **Enhancing the nutritional quality of foods:**
   - Fundamentals of Germination and Fermentation.
   - Food Fortification and Enrichment: Methods, advantages and limitations, safety
5. **Genetically modified food:**
   - Concept, available genetically modified (GM) foods in India, techniques for GM food preparation, steps adopted for acceptability of GM food.
6. **Prebiotic and Probiotic ingredients in foods:**
   - Types of prebiotics and their effects on gut microbes
   - Health benefits and recent development of prebiotics and probiotics
   - Synbiotics
7. **Nutraceutical Enrich Medicinal Plants:**
   - Importance of Medicinal Plants**:** Amla, Brahmi, Arjuna, Garlic, Ginger, Tulsi, Turmeric, Ashwagandha, Aloe-Vera, Sarpgandha, Isubgol.

**Suggested readings:**


- Wildman, Robert. Nutraceuticals and Functional Foods, second edition. Taylor and Francis Group. 2007.

- Brigelius-Flohé, J &Joost HG. Nutritional Genomics: Impact on Health and Disease. Wiley VCH. 2006.
- Cupp J & Tracy TS. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press. 2003.
- Cho S. S. and Dreher, M.L. (2001): Handbook Dietary Fibre, Marcel Dekker Inc., New York.
- Yurawecz, M.P., M.M. Mossoba, J.K.G. Kramer, M.W. Pariza and G.J. Nelson eds (1999)
- Gibson, G., Williams, C. eds (2000): Functional Foods. Woodhead Publishing Ltd. U.K.
- Trease and Evans, Pharmacognosy.
- Goldberg I. Functional Foods: Designer Foods, Pharma Foods. 1994.
- Fuller, R. ed. (1997) Probiotics Applications and Practical Aspects, London: Chapman and Hall, New York.Prazier, W.C. and Westhoff, D.C. (1988): 4th edition, Food Microbiology, MaGraw Hill Inc.
- Gopalan, C. et al: Nutritive value of Indian Foods. Indian Council of Medical Research.


## MAJOR 16: FOOD PROCESSING TECHNOLOGY
**[TOTAL CREDITS: 5 (THEORY-4, TUTORIAL -1)]**

## Course Outcome:

Students will be able to understand the 'Unit operations in food processing'. They will be acquainted with the processing techniques of fruits, vegetables and fruit beverages, preparation of jams, jellies and marmalades, pickles, chutneys, sauces and tomato products, processing of dairy products, egg and egg products, fish and meat. They can gain the knowledge of food packaging and its interaction with food products.

1. **Unit operations in food processing**
   - Cleaning, sorting, grading, peeling, Size reduction, mixing and forming, Separation techniques
2. **Basic concept of food processing:**
   - Basic principles of food processing (moisture removal, heat treatment, sterilization, pasteurization, Blanching, low temperature treatment, acidity control, use of antimicrobial chemical preservatives)
3. **Processing of fruits, vegetables and fruit beverages:**
   - Selection of fruits and vegetables, process of canning, factors affecting the process-time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in canned foods.
   - Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation)

- Drying and mechanical dehydration, process variation for fruits and vegetables, packing and storage**.**

4. **Jams, Jellies and Marmalades:**
   - Jam - Constituents, selection of fruits, processing and technology**.**
   - Jelly-Essential constituents (Role of pectin)
   - Theory of jelly formation, processing and technology
   - Marmalade-Types and processing technology
5. **Pickles, Chutneys, Sauces and Tomato Products:**
   - Selection of tomatoes, pulping and processing of tomato juice, tomato puree, paste, ketchup, sauce and soup**.**
6. **Dairy products processing:**
   - Steps of milk processing
   - Milk products processing- cream, butter oil, cheese, cheese spread, condensed milk, evaporated milk, whole milk, skimmed milk powder, ice cream, khoa, chhana, panner, fermented milk products, yogurt, dahi and srikhand. Instantization of milk and milk products.
7. **Processing of meat and meat products:**
   - Quality of meat, rigor mortis, cold shortening, thaw rigor
   - Red meat processing (Canning, role of chemical additives, cold storage, comminution and curing, drying, fermentation, irradiation, restructuring, smoking and vacuum packaging)
8. **Fish and egg processing**:
   - General methods of fish and egg processing

**Suggested readings:**


- Potter,N. and Hotchkiss,J.H.(1996).Food Science, Fifth Edition, CBS Publishers and Distributors, New Delhi.
- Charley,H.(1982).Food Science ,JohnWiley and Sons, New York. 3. Salunke,D.K and Kodam,S.S. (2001).Handbook of vegetable science and Technology, Marcel Dekker,Inc,270,Madison Avenue, New York.
- Borwankar,R.P and Shoemaker,C.E.(1992).Rheology of Foods.Elsevier Science Publishers Ltd., England.
- Salunke,D.K and Kodam,S.S . (2001). Handbook of Vegetable Science and Technology, Marcel Dekker,Inc., 270,Madison Avenue, New York,NY,10016
- Crusess WB .2004. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India.
- Earle RL. 1985. Unit Operations in Food Processing. Pergamon Press. · Fellows P. 1988. Food Processing Technology. VCH Ellis Horwood.
- Fellows P J (2002), Food Processing Technology- Principles and Practices, 2nd Edition. Woodhead Publishing Ltd

- Girdharilal, Siddappaa, G.S and Tandon, G.L.1998. Preservation of fruits & Vegetables, ICAR, New Delhi.
- Heldman DR & Singh RP.1995. Food Process Engineering. AVI Publ. · McCabe WL & and Smith JC. 1971. Fundamental of Food Engineering. AVI Publ.
- Manay, S. &Shadaksharaswami, M.2004. Foods: Facts and Principles, New Age Publishers.
- Ranganna S.1986. Handbook of analysis and quality control for fruits and vegetable products, Tata Mc Graw-Hill publishing company limited, second edition.
- Sahay KM & Singh KK. 1994. Unit Operation of Agricultural Processing Vikas Publ. House.
- Singh RP & Heldman DR. 1993. Introduction to Food Engineering. Academic Press.
- Srivastava, R.P. and Kumar, S. 2006. Fruits and Vegetables Preservation- Principles and Practices. 3rd Ed. International Book Distributing Co.


## MAJOR 17: FOOD TOXICOLOGY AND IMMUNOLOGY

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

This course deals with fundamentals of immunity and various types of immunity. It helps student to understand both humoral immunity, cell mediated immunity and their interaction. Toxicology deals with various types of toxic agents, their mechanism of action, resultant toxicities and their effect on environment as well as on human health. This course also ensures understanding the importance of vaccination and immunization schedule.

1. **Principles of Toxicology:**
   - Classification of toxic substances
   - Various definitions of toxicological significance
2. **Food toxicity:**
   - Neuro lathyrism, Aflatoxins, Ergot, Epidemic dropsy
   - Endemic ascites, Fusarium toxins
3. **Toxic agents (**Mode of action and effects):
   - **Metals:** Lead and arsenic
   - **Pesticides:** Organophosphates, carbamates, organochlorine, pesticides.
   - **Bacterial toxins:** Exotoxins and Endotoxins
4. **Eco-toxicology:**
   - Movement and effect of toxic compounds in food chain (DDT, Mercury)
   - Bioaccumulation, Biomagnification, Concept of BOD and COD.
5. **Cells and organs of the immune system:**
   - Leucocytes, APC, Macrophage-cell and B-cell
   - Mast cell, Dendritic cell and APC
   - NK cells, Structure and Function of MHC.
6. **Types of antigen and antibodies:**

- Definition and properties of antigenic determinants on immunoglobulin (Isotype, allotype & idiotype)
- Structure and classes of antibodies, Monoclonal and Polyclonal antibodies (Advantages and Limitations)

7. **Types of immune response:**
    - Humoral and Cellular Immunity
    - Innate Immunity: Types of innate immunity, Factors affecting innate immunity, External defence system of the body, Internal defence system (Humoral factors and Cellular factors)
    - Acquired immunity: Types of acquired immunity (Active and Passive immunity) Naturally acquired and artificially acquired active and passive immunity
    - Herd immunity
8. **Vaccination and Immunization schedule:**
    - Types of vaccines (Live, Killed, Attenuated, Recombinant)
    - National immunization schedule

**Suggested reading:**


- Immunology, 8th edition, (2012), Male, D., Brostoff, J., Roth, D.B. and Roitt, I., Elseivier-Sauders. ISBN-13: 978-0323080583.
- An Introduction to Immunology, Immunochemistry and Immunobiology, 5th edition, (1988), Barrett, James T., Mosby Company, St. Louis. ISBN-13: 978-0801605307.
- Immunology: An Introduction, 4th edition, (1994), Tizard, I.R., Saunders College
- Publishing, Philadelphia. ISBN-13: 978-0030041983.
- Cassarett and Doull's "Essentials of Toxicology" 2nd edition (2010), Klaassen and Whatkins,McGraw Hill Publisher. ISBN-13: 978-0071622400.
- Introduction to Toxicology, 3rd edition (2001), John Timbrell, Taylor and Francis Publishers.ISBN 13: 9780415247627.
- Principles of Toxicology, 2nd edition (2006), Stine Karen and Thomas M Brown, CRC press.ISBN-13: 978-0849328565.
- Immunology, 8th edition, (2012), Male, D., Brostoff, J., Roth, D.B. and Roitt, I., Elseivier-Sauders. ISBN-13: 978-0323080583.

## MAJOR 18: EPIDEMIOLOGY AND DISEASE BIOLOGY

**[TOTAL CREDITS: 6 (THEORY-5, TUTORIAL-1)]**

## Course Outcome:

This course explains the concept of public health and disease in details. Understanding the basic principles of Epidemiology with special reference to the prevalence and incidence of a disease, mortality and morbidity rate, factors influencing epidemiology of a disease, descriptive and analytical epidemiological study is essential. Students learn the epidemiology of various bacterial, viral, parasitic and vector borne diseases.

1. **Concept of Disease**:
    - Endemic, Epidemic and Pandemic, Acute and Chronic, Communicable and Non-Communicable; Infectious, Contagious, Sporadic and Zoonotic diseases
    - Infectious disease epidemiology: Infection, Contamination, Infestation
    - Iceberg Phenomenon of a disease
2. **Concept of Public Health:**
    - Basic concept on Public Health, Hygiene, Preventive medicine, Social medicine, Community medicine
3. **Disease prevention and control:**
    - Concept of Prevention: Primordial, Primary, Secondary and Tertiary
    - Modes of intervention: Health Promotion, Specific Protection, Early diagnosis and treatment, Disability limitation, Rehabilitation
    - Notification, Isolation, Treatment, Quarantine
4. **Principles of Epidemiology:**
    - Definition and aims of Epidemiology
    - Rate of Disease in a Population-Attack rate, Mortality and Morbidity rate, Prevalence and Incidence of a disease
    - Epidemiological study-Descriptive and Analytical (Case-Control, Cohort, Longitudinal and Cross-sectional).
    - Factors that influence the epidemiology of a disease and re-emergence of a disease.
5. **Viral diseases:**
    - Epidemiology, mode of transmission, pathogenicity and prevention of viral diseases: Influenza, Measles, Rabies, AIDS, Coronavirus disease (COVID-19).
6. **Bacterial diseases**
    - Epidemiology, mode of transmission, pathogenicity, prevention and control of bacterial diseases (Tuberculosis and Tetanus).
7. **Food parasitic disease:**
    - Amoebiasis: General account, pathogenesis, laboratory diagnosis and control of *Entamoeba histolytica*
8. **Genetic basis and pathophysiology**:
    - Sickle cell anaemia, Haemophilia and Thalassemia

9. **Vector-Borne diseases:**
    - Epidemiology, mode of transmission, pathogenesis and control of Dengue and Malaria

**Suggested readings:**


- Dimmock, N. J. and Primrose, S. B. (1994). Introduction to Modern Virology. 4thed. Blackwell Scientific Publications. London.
- Williams and Wilkins.Bergey's Manual of Determinative Bacteriology. 9th ed.Baltimore
- Maloy, S. R., Cronan, E. J. and Freifelder, D. (1994). Microbial Genetics. 2nd ed.Jones and Bartlett.
- Presscott, L. M., Harley, J. P. and Klein, D. A. (2011). Microbiology. 8th ed.McGraw-Hill, New York.
- Schlegel, H. G. (1993). General Microbiology. 7th ed. Cambridge University Press.
- Slonczeweski, J.L. and Foster, J.W. (2009). Microbiology- An Evolving Science.Norton.
- Stanier, R. Y., Adelberg, E. A. and Ingraham, J. L. (1986). General Microbiology.5th ed. Macmillan.
- Talaro, K. and Talaro, A. (1999). Foundations in Microbiology. 3rd ed. Dubuque,McGraw Hill.
- Tortora, G. J., Funke, B. R., and Case. C. L. (2008). Microbiology. An Introduction.9th ed.
- Menlo Park Calif. Voyleys, B. A. (2002). Benjamin/Cummings Publishing. Thebiology of viruses. 2nd ed. McGraw-Hill.
- Michael T. Madigan, John M. Brock Biology of Microorganisms, 13th edition (2010), Pearson Publishers.


# SEMESTER- VIII (WITHOUT RESEARCH)

## MAJOR-19: BIOLOGICAL TECHNIQUES AND STATISTICS

**[TOTAL CREDITS: 6 (THEORY-5, TUTORIAL-1)]**

## Course Outcome:

The course gives an insight into the basic working principles of common Biological laboratory instruments like microscope, spectrophotometer, chromatography and electrophoresis. Students also learn about basic immunological and microbiological techniques. In Biostatistics, students are acquainted with measures of Central Tendency and measures of Dispersion. Understanding the concept of hypothesis testing through Chi-square Test, Student 'T' test, Analysis of Variance (ANOVA) is also essential.

1. **Microscopy:**
    - Components of a Microscope
    - Light and Compound Microscope

- Theoretical principles of microscopy: Magnification, Wavelength and Resolution
- Principles of Dark-field Microscopy, Phase-Contrast Microscopy, Scanning Electron and Transmission Electron Microscopy

2. **Spectrophotometry:**
   - Beer-Lambert law, light absorption and its transmittance.
3. **Chromatography (Principle, methods and applications):**
   - Concept of chromatography-Mobile phase, Stationary phase, Partition chromatography, Absorption chromatography.
   - Paper chromatography
   - Thin layer chromatography (TLC) and High performance thin layer chromatography (HPTLC)
   - High performance liquid chromatography (HPLC), Gas liquid chromatography (GLC)
4. **Immunological Techniques (Principle, methods and application):**
   - Enzyme Linked Immunosorbent Assay (ELISA)
   - Double diffusion immunoassay (Ouchterlony technique)
5. **Microbiological techniques**:
   - Methods of sterilization, Pure culture techniques, Antibiotic Sensitivity Test
6. **Electrophoresis, PCR and Blotting:**
   - Principle and application of Gel Electrophoresis, PCR, Southern blotting, Northern Blotting and Western Blotting
7. **Biostatistics:**
   - Types of sampling, Design of Sampling, Characteristics of good sampling.
   - Data and Data Types: Primary data and Secondary Data, Methods of data collection, presentation of data-diagrammatic and graphical.
   - Measures of Central Tendency: Mean, Median, Mode.
   - Dispersion: Range, Standard Deviation.
   - Hypothesis Testing: Chi-square Test, Student‘t’ test, Analysis of Variance (ANOVA).

**Suggested readings**


- Physical Biochemistry: Principles and Applications, 2nd edition (2009), David Sheehan, John Wiley. ISBN-13: 978-0470856031.
- Physical Biochemistry: Applications to Biochemistry and Molecular Biology, 2nd edition (1982), David Freifelder, W.H. Freeman and Company. ISBN-13: 978-0716714446.
- Debjyoti Das (2012). Biostatistics.
- E. Batschelet : Introduction to Mathematics for Life Scientists,SpringerVerlag, International Student Edition, Narosa Publishing House, New Delhi (1971, 1975).
- A. Edmondson and D. Druce: Advanced Biology Statistics, Oxford University Press; 1996.

## MAJOR 20: FOOD BIOTECHNOLOGY AND RURAL TECHNOLOGY

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

This course emphasizes the basic understanding of sensory food quality assessment and importance of use of food additives and its effect on health. Students learn the role of biotechnology in food production with special reference to fermented food and GM food. Rural Technology gives an insight into the concept of apiculture and Mushroom cultivation techniques.

1. **Food Quality Assessment:** Sensory assessment-Appearance of food- visual perception, colour of foods, smell, flavour and taste. Threshold tests, difference tests, ranking test & hedonic scale
2. **Fermentation and types of fermentation:**
   - Solid and submerged fermentation
   - Homolactic, Heterolactic, Alcoholic fermentation
   - Bioreactor, Types of bioreactors, Advantages and disadvantages
   - Applications and design aspects of bioreactors used in food industry.
3. **Fermented foods:**
   - Fermented foods and health benefits of fermented foods.
   - Dairy products (Cheese and Butter) and alcoholic beverages- Production process.
4. **Genetically modified crops (Advantages, Limitations)**:
   - Bt brinjal, Bt maize, Golden Rice.
5. **Food Additives (Purpose and Health concern):**
   - Presevatives, coluring agents, flavour and flavour enhancer
   - Anti-oxidants, artificial sweeteners, stabilizers
   - Thickening agents, anticaking agents
   - Bleaching and maturing agents, flour improvers
   - Leavening agents, surface active agents.
6. **Mushroom cultivation technique**
   - Types of edible Mushroom species
   - Nutritional value of Mushrooms, Medicinal value of mushrooms.
   - Mushroom Production Technique – Button Mushroom (*Agaricus*), Oyester Mushroom (*Pleurotua*), Paddy Straw Mushroom (*Volvariella*)
   - Spawn Production Techniques: Preparation of culture, mother spawn production, multiplication of spawn
7. **Apiculture**
   - Species of honeybee and their castes.
   - Equipment and Appliances: Bee Hive, Comb, other appliances for bee keeping. Artificial feeding of honeybees.

- Properties of Honey: Physical and chemical properties of honey, Honey bee products and their values
- Honey extraction and processing.

**Suggested reading:**


- Potter NN.Hotchkiss JH. Food Science. CBS publishers and distributers
- S. Manany, NS. Swamy Food Facts and Principles. New Age International Publishers.
- Potter NN , Hotchkiss JH. Food Science. CBS publishers and distributers
- Day SC. 2021. Mushroom Growing, Agrobios India.
- Pathak Yadav Gour, Mushroom: Production and Processing Technology,
- Agrobios India.
- Ram RC. 2007. Mushroom and their Cultivation, Technique AavishkarPublishers,Distributors, Jaipur India
- Phillips EF.2018. Beekeeping, Agrobios, India


## MAJOR 21: MOLECULAR BIOLOGY AND BIOINFORMATICS

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

The course deals with the basics of genetic material and the mechanism of genetic exchange. Students get introduced with the concept of genomics, proteomics and DNA recombinant Technology. In Bioinformatics, students learn how computer programming can helps to restore the biological data through biological algorithm.

1. **Overview of Molecular Biology:**
   - Nucleic acid: Bases, nucleosides and nucleotides.
   - Types of DNA and RNA, DNA and RNA as genetic material.
   - Salient features of DNA and RNA
   - Watson and Crick Model of DNA
   - Properties and types of Plasmid
   - Basic mechanism of DNA replication, transcription and translation (Prokaryotes)
2. **Mechanisms of Genetic Exchange:**
   - Transformation - Discovery, mechanism of natural competence
   - Conjugation - Discovery, mechanism, Hfr and F' strains
   - Transduction - Generalized transduction, specialized transduction
3. **Introduction to recombinant DNA techniques and their application**
4. **Genomics and Proteomics:**
   - Basic idea of Genomics and Proteomics
5. **Basic concept of Bioinformatics:**
   - Aims and applications of Bioinformatics
6. **Data bases:**
   - Nucleic acid Data Bases: Gen Bank, EMBL, DDBJ
   - Protein Data Bases: PIR, SWISS-PROT, TrEMBL and PDB

7. **Sequence alignments:**
    - Principle, Sequence alignment: Global match, Local match,
    - Sequence similarity searching by BLAST
    - Significance of Multiple Sequence Alignments
    - Phylogenetic tree: Types and importance of phylogenetic tree
8. **Nutrigenomics:**
    - Concept and application of Nutrigenomics
    - Concept of Gene-nutrient interaction

**Suggested readings**


- Albert Bruce, Bray Dennis, LevisJulian,Raff Martin, Roberts Keith and Watson James (2008).Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.
- Cooper, G.M. and Hausman, R.E. (2009). The Cell: AMolecularApproach.5thEdition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
- Hardin, J. Bertoni, G and Klein smith, J. L. (2012). Becker's World of the Cell. 8th Edn, Pearson Benjamin Cummings, San Francisco.
- Harvey, L. (2004). Molecular Cell Biology. 5th Edn. W.H. Freeman 5. Karp, G. (2008). Cell and Molecular biology: Concepts and Application. 5th Edn, John Wiley.
- Lodish, Berk, Matsudaira, Kaiser, Bretscher, Ploegh, Amon, and Martin (2016) Molecular Cell Biology. 8th Edn. W.H. Freeman
- Pal, A. (2011). Textbook of Cell and Molecular Biology 3rd Edn, Bokks and Allied, Kolkata. 8. Plopper, G, D. Sharp, Siroski, E (2015) Lewin's Cell 3rdEdition—Johns & Bartlett Publishers
- Saxena Sanjay (2003) A First Course in Computers, Vikas Publishing House.
- Pradeep and Sinha Preeti (2007) Foundations of Computing, 4th ed., BPB Publications.
- LeskM.A.(2008) Introduction to Bioinformatics. Oxford Publication, 3rd International Student Edition.
- RastogiS.C., Mendiratta N. and Rastogi P. (2007) Bioinformatics: methods and applications, genomics, proteomics and drug discovery, 2nd ed. Prentice Hall India Publication.
- Primrose and Twyman (2003) Principles of Genome Analysis & Genomics. Blackwell.
- Debjyoti Das (2012). Biostatistics.
- E.Batschelet: Introduction to Mathematics for Life Scientists,SpringerVerlag, International Student Edition, Narosa Publishing House, New Delhi (1971, 1975).

## MAJOR -22: PRACTICAL
### (BIOLOGICAL TECHNIQUES, BIOSTATISTICS AND COMPUTATIONAL BIOLOGY)
### [TOTAL CREDITS: 4 (PRACTICAL-4)]

**Biological Techniques:**

1. Visit to any laboratory of Biological Sciences / Research laboratory / University Laboratory/ Bio-Instrumentation Centre and report preparation and Power Point presentation
2. Paper Chromatography
3. Antibiotic sensitivity test (Disc method)

**Biostatistics and Computational Biology:**

1. Computerized presentation of bar diagram, histogram, line diagram, pie chart using various data.
2. Computer based calculation of Mean, Median, Mode, Standard deviation and Standard Error
3. Retrieval of nucleic acid/protein sequence from data bases, Storing of sequence and conversion of one sequence format to another, Sequence alignment (pair-wise alignment and multiple sequence alignment).
4. Retrieval of protein structure from Protein Data Bank, Protein structure visualization.

# SEMESTER VIII (WITH RESEARCH)

## MAJOR-19: BIOLOGICAL TECHNIQUES AND STATISTICS
### [TOTAL CREDITS: 6 (THEORY-5, TUTORIAL-1)]

## Course Outcome:

The course gives an insight into the basic working principles of common Biological laboratory instruments like microscope, spectrophotometer, chromatography and electrophoresis. Students also learn about basic immunological and microbiological techniques. In Biostatistics, students are acquainted with measures of Central Tendency and measures of Dispersion. Understanding the concept of hypothesis testing through Chi-square Test, Student 'T' test, Analysis of Variance (ANOVA) is also essential.

**1. Microscopy:**

- Components of a microscope
- Light and compound Microscope
- Theoretical principles of microscopy: Magnification, Wavelength and Resolution
- Principles of Dark-field Microscopy, Phase-Contrast Microscopy, Scanning Electron and Transmission Electron Microscopy

**2. Spectrophotometry:**

- Beer-Lambert law, light absorption and its transmittance.

**3. Chromatography (Principle, methods and applications):**

- Concept of chromatography-Mobile phase, Stationary phase, Partition chromatography, Absorption chromatography.

- Paper chromatography
- Thin layer chromatography (TLC) and High performance thin layer chromatography (HPTLC)
- High performance liquid chromatography (HPLC), Gas liquid chromatography (GLC)

4. **Immunological Techniques (Principle, methods and application):**
    - Enzyme Linked Immunosorbent Assay (ELISA)
    - Double diffusion immunoassay (Ouchterlony technique)

5. **Microbiological techniques**:
    - Methods of sterilization, Pure culture techniques, Antibiotic Sensitivity Test
6. **Electrophoresis, PCR and Blotting:**
    - Principle and application of Gel Electrophoresis, PCR, Southern blotting, Northern Blotting and Western Blotting
7. **Biostatistics:**
    - Types of sampling, Design of Sampling, Characteristics of good sampling.
    - Data and Data Types: Primary data and Secondary Data, Methods of data collection, presentation of data-diagrammatic and graphical.
    - Measures of Central Tendency: Mean, Median, Mode.
    - Dispersion: Range, Standard Deviation.
    - Hypothesis Testing: Chi-square Test, Student't' test, Analysis of Variance (ANOVA).

**Suggested readings**


- Physical Biochemistry: Principles and Applications, 2nd edition (2009), David Sheehan, John Wiley. ISBN-13: 978-0470856031.
- Physical Biochemistry: Applications to Biochemistry and Molecular Biology, 2nd edition (1982), David Freifelder, W.H. Freeman and Company. ISBN-13: 978-0716714446.
- Debjyoti Das (2012). Biostatistics.
- E. Batschelet : Introduction to Mathematics for Life Scientists,SpringerVerlag, International Student Edition, Narosa Publishing House, New Delhi (1971, 1975).
- A. Edmondson and D. Druce: Advanced Biology Statistics, Oxford University Press; 1996.


**PROJECT WORK / DISSERTATION (Instead of MAJOR 20, 21 and 22)**
**[TOTAL CREDITS: 12]**

# LIST OF MINOR COURSES

| Semester No | Course No | Course Title |
|---|---|---|
| I | MINOR 1 | FOOD GROUPS, NUTRIENTS AND NUTRITION |
| II | MINOR 2 | HUMAN NUTRITION AND PHASES OF LIFE |
| III | MINOR 3 | NUTRIENTS AND ITS ROLE |
| IV | MINOR 4 | MEDICAL NUTRITION THERAPY |
| V | MINOR 5 | FOOD SPOILAGE AND PRESERVATION METHOD |
| VI | MINOR 6 | COMMUNITY NUTRITION |
| VII | MINOR 7 | NUTRACEUTICAL AND HEALTH |
| VIII | MINOR 8 | FOOD BIOTECHNOLOGY AND RURAL TECHNOLOGY |

## SEMESTER – I

### MINOR 1: FOOD GROUPS, NUTRIENTS AND NUTRITION

**[TOTAL CREDITS: 4 (THEORY-3, Tutorial-1)]**

## Course Outcome:

The students will have a basic concept on food, nutrition and health. The student will be able to understand the chemistry of food components like proteins, carbohydrates and lipids. They will have fundamental concept about various food commodities.

**10. Basic concept of Food, Nutrition and Health:**

- Definition: Food, Nutrients, Nutritive value, Nutrition, Malnutrition, Undernutrition
- Functions of food, Balanced Diet.
- Food Groups, Food Pyramid, My plate
- Concept of health and dimensions of health

**11. Cereals, Pulses and legumes:**

- Nutritional aspects of wheat, rice and oat.
- Types of pulses and legumes, uses, and nutritional aspects.

**12. Milk and milk Products:**

- Composition and nutrients of milk
- Nutritive value and Concept of milk processing and Pasteurization

- Types of processed milk, milk products (butter, curd, paneer and cheese)
- Probiotics in fermented milk products

**13. Egg, Fish and meat:**

- Uses and nutritional aspects of edible fish, egg and meat, concept of red and white meat.

14. **Vegetables and fruits:**

- Uses and nutritional aspect of commonly available vegetables.
- Fresh fruits and dry fruits– raw and processed product.

**15. Salts, Fats and oils:**

- Uses and nutritional aspects of various salts.
- Types, sources, use and nutritional aspects of fats and oils.

**16. Beverages:**

- Common types (tea, coffee and wines) and their uses, nutritional aspect.

**17. Food adjuncts and preserved products:**

- Spices (Chilies, Turmeric, Garlic and Ginger), use and nutritional aspect.
- Jams, Jellies, Pickles, Syrup, Squashes–uses and nutritional aspects.

18. **Methods of cooking:**

- Dry, moist, frying and microwave cooking.
- Effect of various methods of cooking on foods, nutrient losses in cooking.

**Suggested readings:**


- Hughes O, Bennion M (1970). Introductory Foods, Macrnillan& Co. New York.
- Lavies S (1998). Food Commodities.
- Pomeranz Y (Ed) (1991). Functional Properties of Food Components, (2nd edition), Academic Press, New York.
- Tindall HD (1983). Vegetables in the Tropics, MacMillan Press, London.
- Winton AL, Winton KB (1999). Techniques of Food Analysis. Allied Scientific Publishers.


# SEMESTER – II

## MINOR 2: HUMAN NUTRITION AND PHASES OF LIFE

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

This course deals with actual requirement of an individual throughout the normal life span. Students obtain knowledge about the importance of breast feeding and weaning in infancy, childhood, adolescence and adulthood. Understanding the importance of additional nutritional demand during pregnancy and lactation and dietary management of Athletes and old aged people is essential for formulating an adequate diet for them.

1. **Concept and definition of terms:**
    - Growth, Development, Malnutrition and Health, Scope of Nutrition.
    - Growth monitoring and promotion-Use of growth charts and standards, Preventions of growth faltering.

2. **Minimum nutritional requirement and RDA:**
    - Formulation of RDA, dietary guidelines with reference to man and woman.
3. **Nutrition during infancy:**
    - Breast feeding, Formula feeding, Weaning, Supplementary foods, Nutritional management of Preterm baby.
4. **Nutrition for children:**
    - Diet in early childhood, elementary school age, high school age.
5. **Nutrition for adult: Male and female**
6. **Nutrition during pregnancy and lactation:**
    - Nutritional demands of Pregnancy, Food selection during Pregnancy, Complications of pregnancy and dietary management, Diet during Lactation.
7. **Nutrition for athletes:**
    - Nutritional requirements and dietary management for sportsman and athletes, Meal planning for athletes, Carbohydrate loading
8. **Geriatric nutrition:**
    - Planning of meals for older people, Nutrition of aged persons, Physiological complications in geriatric group and dietary modifications required, Oxidative stress and aging and role of antioxidative nutrients for preventing aging.
9. **Principles of meal planning:**
    - Food exchange list, Factors affecting meal planning and food related behavior.
    - Dietary guidelines for Indians.

## SEMESTER – III

### MINOR 3: NUTRIENTS AND ITS ROLE

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

The course deals with a complete understanding of dietary sources, daily requirement, physiological role and deficiency disorders of various macronutrients and micronutrients. Students learn the importance of energy balance and energy requirement throughout the lifespan. Knowledge is also imparted on the interaction of various nutrients with drugs

**1. Role of Macronutrients (Carbohydrates, Proteins & Lipids):**

- Definition, Classification, Structure, Physiological role, Dietary sources, Deficiency and excess disorders

**2. Role of Vitamins:**

- Fat soluble vitamins-Physiological role, dietary sources, deficiency and excess disorders.
- Water soluble vitamins- Physiological role, dietary sources, deficiency and excess disorders.

**3. Role of Minerals (Ca, P, Fe, Na, K, I, Zn, Mn, Mg, Co, Se):**

- Physiological role, dietary sources and deficiency and excess disorders.

**4. Dietary fibre:**

- Classification and nutritional significance of dietary fibre.

**5. Water:**

- Functions, Requirements, Concept of water balance.

**6. Energy in human nutrition:**

- Energy and its unit, Energy assessment and balance, Factors of energy requirement, BMR and its regulation, SDA of food**.**

**7. Nutrient and Drug Interaction:**

- Basic Concept, Effect of nutrition on drugs, Drug effects on nutritional status, Drug and drug interaction
- Clinical significance and risk factors for drug-nutrient interactions

**Suggested readings:**


- Gopalan C (1988). Nutritive value of Indian Foods. Indian Council of Medical Research.
- Guthrie AH (1986). Introductory Nutrition, 6th Ed. The C.V. Mesby Company.
- Indian Council of Medical Research (2003). Nutrient Requirements and Recommended-Dietary Allowance for Indians. New Delhi.
- WHO (1979). A growth chart for International use in Maternal and Children Health Care, Geneva.
- Winword(1988). Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.
- Swaminathan M (2009). Essentials of Foods and Nutrition, Vols -1 and II. Ganesh and Co. Madras.


## SEMESTER – IV

### MINOR 4: MEDICAL NUTRITION THERAPY

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

Students will have a basic idea about diet therapy and the role of a dietitian. Students will be able to comprehend the pathophysiology and diet therapy of commonly occurring diseases. They will be able to correlate physiology with various disorders (Gastro-intestinal and cardiovascular disorders), their pathogenesis and their dietary management.

1. **General ideas of diet therapy:**
   - Therapeutic adaptations of normal diet, Classification of therapeutic diets (Progressive diets – Normal, Soft, Clear and Full fluid).
2. **Dietitians and basic hospital diets:**
   - Types of dietitians and role of dietitian.

- Nutritional adequacy of hospital diets, Basic concept and methods of (i) Oral feeding (ii) Tube feeding (iii) Parenteral feeding.

3. **Diets in febrile conditions, infections and surgical conditions.**
4. **Pathophysiology, clinical symptoms, diagnostic tests and dietary management of Gastrointestinal disorders/diseases:**
   - Gastro-intestinal tract diseases - Diarrhoea, Constipation, Irritable Bowel Syndrome, Inflammatory Bowel Disease, Diverticular disease, Flatulence, Peptic ulcer, Ulcerative Colitis, Hemorrhoids
   - Liver, gall bladder and pancreatic diseases- Viral hepatitis and Cirrhosis of liver, Cholelithiasis, Cholecystitis, Cholecystectomy, Pancreatitis
   - Malabsorption syndrome, eating disorders (Anorexia nervosa and Bulimia).
5. **Pathophysiology, clinical symptoms, diagnostic tests and dietary management of cardiovascular disorder/diseases:**
   - Brief review of lipoproteins (TC, TG, LDL, HDL, VLDL)
   - Hypertension
   - Atherosclerosis–etiology and risk factor.
   - Dietary care: ischemic heart disease, arteriosclerosis and hyperlipidemia.
6. **Pathophysiology, clinical symptoms, and dietary management of Osteoarthritis**

**Suggested readings:**


- Anderson L, Dibble MV, Tukki PR, Mitchall HS, and Rynbergin HJ. Nutrition in Health and Disease. 17th edition, JB Lipincott& Co. Philadelphia.
- Anita FP. Clinical Dietetics and Nutrition. Second Edition, Oxford University Press, Delhi.
- Davis J and Sherer K (1994). Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, WB Saunders Co.
- Escott-Stump S (1998). Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkinson
- Garrow JS, James WPT and Ralph A (2000). Human Nutrition and Diabetics, 10th Edition, Churchill Livingstone.
- Gibney MJ, Elia M, Ljungqvist & Dowsett J. (2005) Clinical Nutrition. The Nutrition Society Textbook Series. Blackwell Publishing Company
- Gibson SR. (2005). Principles of Nutritional Assessment. 2nd Edition. Oxford University press · Joshi YK. Basics of Clinical Nutrition. 2nd Edition. Jaypee Brothers Medical Publishers.
- Lee RD & Neiman DC. (2009). Nutritional Assessment. 5th Edition. Brown & Benchmark.
- Mahan, L. K. and Escott Stump. S. (2016) Krause's Food & Nutrition Therapy 14th ed. Saunders-Elsevier ·Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) Modern Nutrition in Health and Disease. 10th ed. Lipincott, William and Wilkins.
- Williams, S.R. (2001) Basic Nutrition and Diet Therapy. 11th ed. Times Mirror Mosby College Publishing

# SEMESTER – V

## MINOR 5: FOOD SPOILAGE AND PRESERVATION METHOD

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

This course helps the students to understand the mechanisms of food spoilage and deterioration of foods and its raw materials by microbial, chemical and physical means. Students gather elaborate knowledge on the basic principles of food preservation processes. It also explains the importance of food packaging to ensure good shelf life.

8. **Fundamentals of food spoilage:**
    - Classification of food based on pH.
    - Definition-shelf life, perishable and semi perishable foods, shelf stable foods.
    - Role of microorganisms in the spoilage of different kinds of food – cereal and cereal products, vegetables and fruits, fish and other sea foods, meat and meat products, milk and milk products.
9. **Preservation by low and high temperature:**
    - Heat preservation methods: Sterilization, Pasteurization and blanching.
10. **Preservation by removal of heat / Low temperature**:
    - Principle of freezing, changes occurring during freezing, rate of freezing
    - Types of freezing - slow freezing and quick freezing.
    - Cryopreservation and cryoprotectants, lyophilization, antifreeze proteins, frozen food storage and thawing.
11. **Preservation by Moisture control:**
    - Concept of drying and dehydration**,** differences between sun drying and dehydration (i.e. mechanical drying).
    - Factors affecting rate of drying, types of driers used in the food industry.
12. **Preservation by Irradiation:**
    - Units of radiation, kinds of ionizing radiations used in food irradiation.
    - Mechanism of action, concept of cold sterilization.
13. **Preservation by Salt, Sugar and Chemical Preservatives**
14. **Food Packaging:**
    - Concept, needs and classification of packaging.
    - Packaging materials, Methods of packaging.
    - Labelling and Bar Coding.

**Suggested readings**


- B. Srilakshmi, Food science, New Age Publishers, 2002.
- Meyer, Food Chemistry, New Age, 2004.
- Bawa. A.S, O.P Chauhanetal. Food Science. New India Publishing agency, 2013.
- Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004.
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010). Basic Food Preparation:A Complete Manual, Fourth Edition. Orient Black Swan Ltd.
- Manay S. and Shadaksharaswamy M (2002). Foods–Facts and Principles. Wiley Eastern Ltd.
- Potter H (1995). Food Science, 5th Edition. CBS Publishers & Distributors

# SEMESTER – VI

## MINOR 6: COMMUNITY NUTRITION

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

On completion of the course, students are expected to be able to understand the concept and purpose of nutritional status assessment in community setting. They will be able to explain nutritional concerns among vulnerable sections of the community and strategies to combat them. They will gain knowledge with regard to standard methods and techniques for assessing nutritional status. Students' will be familiar with the use of indices and indicators for screening and consequent identification of malnutrition in the community.

7. **Community and Population:**
    - Community and its types – Rural and Urban
    - Characteristics of Community and population
    - Demography: Concept, Factors affecting demography, Demographic cycle, Indian demographic history
    - Factors affecting health of the Community.
8. **Assessment of Nutritional Status and Surveillance:**
    - Nutrition Monitoring and Surveillance: Objectives, Components, Process and Uses.
    - Direct Nutritional status assessment of human groups - Anthropometric, Biochemical, Biophysical, Clinical and Diet survey methods.
    - Nutritional anthropometry: Need and importance, standard for reference techniques of measuring height, weight, head, chest and arm circumference, interpretation of these measurements. Use of growth chart.
    - Indirect assessment: Secondary sources of community health data.
    - Clinical Signs: Identifying signs of PEM, vitamin A deficiency and iodine deficiency, Interpretation of descriptive list of clinical signs.
9. **Community Water and Waste Management:**
    - Importance of water to the community
    - Water-borne disease: Cholera and typhoid (Causative agent, Symptoms and preventive measures)
    - Microbiological Examination of drinking water (MPN test)
    - Sources of safe drinking water, characteristics potable water
    - Sewage disposal and treatment.
10. **Surveillance systems and the role of Agencies and Organizations:**
    - Role of international and national organizations and agencies (WHO, FAO, UNICEF, World Bank, CARE, NIN, CFTRI, ICMR, ICAR).
11. **National Nutritional Intervention Programmes:**
    - Objective, Target group, Scheme details - Integrated Child Development Services (ICDS), Mid-Day Meal Programme (MDMP), Vit A prophylaxis programme, Anemia prophylaxis programme, Iodine deficiency disorders control programme.

- Concept on public distribution system.

**12. Communication in Nutrition and Health Education:**

- Types, process and media of communication.
- Interpersonal, Group and Mass communication.
- Importance and relevance of Information, Education and communication (IEC) in Nutrition and Public Health.

**Suggested readings:**


- Park K (2009). Park's Textbook of Preventive and Social Medicine, 20th Edition, M/s BanarasidasBhanot, Jabalpur.
- Gordis L (1996). Epidemiology, Saunders, Pennsylvania.
- Norell SE (1998): Workbook of Epidemiology. Oxford: University Press, New York.
- Owen AY and Frankle RT (1986). Nutrition in the Community, The Art of Delivering Services, 2nd Edition, Times Mirror/Mosby.
- Roday, S. (1999) Food Hygiene and Sanitation. 1st Edition, Tata McGraw Hill, New Delhi.
- Saha A, Shattock F, Mustafa T. Epidemology in Primary Health Care. The McGraw-Hill Companies.


# SEMESTER – VII

## MINOR 7: NUTRACEUTICAL AND HEALTH

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

This course gives an insight into the recent discoveries in the field of Food and Nutrition especially Functional Foods and Nutraceuticals. It enlists the potential health benefits of common functional foods and nutraceuticals – like Prebiotics, Probiotics and Dietary Fibers. Knowledge is also imparted on the fundamentals of GM food, various methods to enhance the nutritional quality of food and nutraceutical enrich medicinal plants.

**8. Physical activity and health:**

- Importance and benefits of physical activity
- Physical Activity – frequency, intensity, time and type with examples
- Physical Activity Guidelines and physical activity pyramid

**9. Nutraceutical and Health:**

- Concept, classification, sources and importance of nutraceuticals.
- Natural occurrence of certain phytochemicals- Antioxidants and flavonoids: omega–3 fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds.
- Role of nutraceuticals on diabetes, obesity and cardiovascular diseases.

**3. Oxidative stress and Nutraceutical:**

- Concept of oxidant and ROS, Antioxidant (Natural and synthetic)

- Enzymatic and non enzymatic antioxidant
- Oxidative stress and nutraceutical on oxidative stress.

**4. Enhancing the nutritional quality of foods:**

- Fundamentals of Germination and Fermentation.
- Food Fortification and Enrichment: Methods, advantages and limitations, safety

**5. Genetically modified food:**

- Concept, available genetically modified (GM) foods in India, techniques for GM food preparation, steps adopted for acceptability of GM food.

**6. Prebiotic and Probiotic ingredients in foods:**

- Types of prebiotics and their effects on gut microbes
- Health benefits and recent development of prebiotics and probiotics
- Synbiotics

**7. Nutraceutical Enrich Medicinal Plants:**

- Importance of Medicinal Plants**:** Amla, Brahmi, Arjuna, Garlic, Ginger, Tulsi, Turmeric, Ashwagandha, Aloe-Vera, Sarpgandha, Isubgol.

**Suggested readings:**


- Wildman, Robert. Nutraceuticals and Functional Foods, second edition. Taylor and Francis Group. 2007.
- Brigelius-Flohé, J &Joost HG. Nutritional Genomics: Impact on Health and Disease. Wiley VCH. 2006.
- Cupp J & Tracy TS. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press. 2003.
- Cho S. S. and Dreher, M.L. (2001): Handbook Dietary Fibre, Marcel Dekker Inc., New York.
- Yurawecz, M.P., M.M. Mossoba, J.K.G. Kramer, M.W. Pariza and G.J. Nelson eds (1999)
- Gibson, G., Williams, C. eds (2000): Functional Foods. Woodhead Publishing Ltd. U.K.
- Trease and Evans, Pharmacognosy.
- Goldberg I. Functional Foods: Designer Foods, Pharma Foods. 1994.
- Fuller, R. ed. (1997) Probiotics Applications and Practical Aspects, London: Chapman and Hall, New York.Prazier, W.C. and Westhoff, D.C. (1988): 4th edition, Food Microbiology, MaGraw Hill Inc.
- Gopalan, C. et al: Nutritive value of Indian Foods. Indian Council of Medical Research.

# SEMESTER – VIII

## MINOR 8: FOOD BIOTECHNOLOGY AND RURAL TECHNOLOGY

**[TOTAL CREDITS: 4 (THEORY-3, TUTORIAL-1)]**

## Course Outcome:

This course emphasizes the basic understanding of sensory food quality assessment and importance of use of food additives and its effect on health. Students learn the role of biotechnology in food production with special reference to fermented food and GM food. Rural Technology gives an insight into the concept of apiculture and Mushroom cultivation techniques.

1. **Food Quality Assessment:** Sensory assessment-Appearance of food- visual perception, colour of foods, smell, flavour and taste. Threshold tests, difference tests, ranking test & hedonic scale
2. **Fermentation and types of fermentation:**
   - Solid and submerged fermentation
   - Homolactic, Heterolactic, Alcoholic fermentation
   - Bioreactor, Types of bioreactors, Advantages and disadvantages
   - Applications and design aspects of bioreactors used in food industry.
3. **Fermented foods:**
   - Fermented foods and health benefits of fermented foods.
   - Dairy products (Cheese and Butter) and alcoholic beverages- Production process.
4. **Genetically modified crops (Advantages, Limitations)**:
   - Bt brinjal, Bt maize, Golden Rice.
5. **Food Additives (Purpose and Health concern):**
   - Presevatives, coluring agents, flavour and flavour enhancer
   - Anti-oxidants, artificial sweeteners, stabilizers
   - Thickening agents, anticaking agents
   - Bleaching and maturing agents, flour improvers
   - Leavening agents, surface active agents.
6. **Mushroom cultivation technique**
   - Types of edible Mushroom species
   - Nutritional value of Mushrooms, Medicinal value of mushrooms.
   - Mushroom Production Technique – Button Mushroom (*Agaricus*), Oyester Mushroom (*Pleurotua*), Paddy Straw Mushroom (*Volvariella*)
   - Spawn Production Techniques: Preparation of culture, mother spawn production, multiplication of spawn
7. **Apiculture**
   - Species of honeybee and their castes.
   - Equipment and Appliances: Bee Hive, Comb, other appliances for bee keeping. Artificial feeding of honeybees.

- Properties of Honey: Physical and chemical properties of honey, Honey bee products and their values
- Honey extraction and processing.

**Suggested reading:**


- Potter NN.Hotchkiss JH. Food Science. CBS publishers and distributers
- S. Manany, NS. Swamy Food Facts and Principles. New Age International Publishers.
- Potter NN , Hotchkiss JH. Food Science. CBS publishers and distributers
- Day SC. 2021. Mushroom Growing, Agrobios India.
- Pathak Yadav Gour, Mushroom: Production and Processing Technology,
- Agrobios India.
- Ram RC. 2007. Mushroom and their Cultivation, Technique AavishkarPublishers,Distributors, Jaipur India
- Phillips EF.2018. Beekeeping, Agrobios, India

# LIST OF SKILL ENHANCEMENT COURSE (SEC)

| Semester No | Course No | Course Title |
|---|---|---|
| I | SEC 1 | DIABETES AND DIABETES MANAGEMENT |
| II | SEC 2 | PATHOLOGY AND LABORATORY TECHNIQUES |
| III | SEC 3 | HEALTH CARE AND HEALTH EDUCATION |

## SEMESTER-I

### SEC 1: DIABETES AND DIABETES MANAGEMENT

**[TOTAL CREDITS-3 (THEORY-2, TUTORIAL-1)]**

## Course Outcome:

This course is designed to equip the students with the knowledge and skills necessary to provide high-quality care to diabetic patients. Students will learn about the diagnosis of diabetes, dietary advice for patients with diabetes, monitoring and management of diabetes, oral hypoglycaemics, insulin management, and common problems encountered in the care of patients with diabetes. Upon completing the program, students will have a strong understanding of the diagnosis, management, and care of patients with diabetes.

1. **Etiologic classification of diabetes mellitus**
   - Type-1 Diabetes mellitus
   - Type-2 Diabetes mellitus
   - Other specific types of Diabetes
   - Gestational Diabetes mellitus
2. **Epidemiology and risk factors**
   - Reasons for increasing prevalence
   - Major risk factors for type 2 diabetes mellitus
3. **Pathophysiology and clinical features of Diabetes**
   - Normal insulin metabolism
   - Pathogenesis of Type-1 Diabetes mellitus: **Genetic susceptibility, autoimmunity and environmental factors**
   - Pathogenesis of Type-2 Diabetes mellitus: Genetic factors, **Constitutional factors,** Insulin resistance, **Impaired insulin secretion, Increased hepatic glucose synthesis**
   - **Clinical features of** Type-1 and Type-2 Diabetes mellitus
   - **Contrasting features of type 1 and type 2 diabetes mellitus**

4. **Complications of Diabetes**
   Acute metabolic complications:
   - **Diabetic ketoacidosis (DKA)**
   - **Hyperosmolar hyperglycaemic nonketotic coma (HHS), Hypoglycaemia**

   Late systemic complications:
   - **Atherosclerosis**
   - **Diabetic microangiopathy**
   - Diabetic nephropathy
   - **Diabetic neuropathy**
   - **Diabetic retinopathy**
   - Infections
5. **Diabetic parameter (Principle of test, reference value, Interpretation):**
   - **Urine testing**: **Glucosuria**, **Ketonuria**
   - **Blood sugar estimation (Fasting, PP, Random)**
   - **Oral glucose tolerance test**
   - Glycosylated haemoglobin test
   - Insulin and C-peptide assay (ELISA)
6. **Management of Diabetes:**
   - Dietary and Life style: Basic dietary guidelines and recommended diets in diabetes, Role of exercise
   - Drugs and insulin in the management of diabetes.
   - Dietary fibre and nutraceutical: Definition, classification and role.
   - Nutrition for the diabetic child
   - The Diabetes Prevention Programme (DPP)

**Suggested readings:**


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

# SEMESTER-II

## SEC –2: PATHOLOGY AND LABORATORY TECHNIQUES

**[TOTAL CREDITS-3 (THEORY-2, TUTORIAL-1)]**

**Course outcome:**

In this course, the students will be introduced to the fundamental concepts of basic medical laboratory technology and the career opportunities available in this field. This course provides an insight to the students regarding various issues associated with laboratory works like investigation of bio-fluids, analysis of blood smear etc. and building up goodwill and reputation of Laboratory or Hospitals with the essential concepts of medical diagnostics. Students will be able to develop practical understanding with basic medical laboratory techniques. They will be provided a brief insight about personal grooming and its stages, meaning and importance of knowledge of Laboratory base works and other key dimensions of laboratory management in Hospitals.

1. **Cellular Adaptations, Cell Injury and Cell Death:**
    - Causes and mechanisms of cell injury.
    - Brief concept of cellular responses: Hyperplasia, Hypertrophy, Atrophy, Metaplasia, Necrosis, Apoptosis.
2. **Hemodynamic Pathology:**
    - Brief concept on Edema, Hyperaemia, Haemorrhage, Haemostasis and Thrombosis.
3. **Cell proliferation and Cancer:**
    - Characteristics of benign and malignant neoplasms, grading and staging of cancer (In brief).
4. **Pathology of Urine:**
    - Physical characteristics-Color, transparency, pH and specific gravity.
    - Chemical characteristics-Protein, Sugar, Ketone bodies, Bile.
    - Microscopical features- RBC, Epithelial cell, Pus cells, Casts and Crystals.
5. **Analysis of Blood (Principle, Technique, Reference value and Clinical significance):**
    - Preparation of Blood smear
    - Differential Leucocyte Count (D.L.C) using Leishman's stain
    - TC of RBC, WBC and Platelet using haemocytometer
    - Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)
6. **Diagnosis of Hypertension and Cardio-vascular diseases (CVDs)**
    - Determination of Blood pressure and ECG
7. **Techniques for the diagnosis of communicable Diseases**
    - Tuberculosis (Ziehl-Neelsen acid-fast staining method)
    - Malaria (Microscope based and ELISA based) and Dengue
8. **Clinical Biochemistry (Principle, Reference value and Clinical significance)**
    - Liver Function Tests (LFTs), Renal function Test (RFTs), Lipid profiling
9. **Medical imaging:**
    - Basic principle and applications of X-Ray, Ultrasonography, MRI and CT scan

**Suggested readings:**


- Robbins and Cotran Pathologic Basis of Disease, 8th edition (2009), Vinay Kumar, Abul K. Abbas, Jon C. Aster, Nelson Fausto; Saunders Publishers, ISBN-13: 978-1416031215.
- General and Systematic Pathology, 2nd edition (1996), J., Ed. Underwood and J. C. E. Underwood; Churchill Livingstone, ISBN-13: 978-0443052828.
- Robbins Basic Pathology, 9th edition (2012), Kumar, Abbas, Fausto and Mitchell; Saunders Publication, ISBN-13: 978-1437717815.
- Medical Laboratory Technology Methods and Interpretations Volume 1 and 2, 6th edition (2009), Ramnik Sood; Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496


# SEMESTER-III

## SEC 3: HEALTH CARE AND HEALTH EDUCATION

**[TOTAL CREDITS-3 (THEORY-2, TUTORIAL-1)]**

## Course Outcome:

Under this course, the students will be introduced to the different issues of health care of the community. This course provides an insight to the students about the principle of health care system, concept of occupational health and disorders, knowledge about family planning. They will be provided a brief insight about health planning and management as well as principle and practice of health education.

### 1. Health Care of the Community

- Concept of health care and levels of health care
- Elements of health care, Principles of primary health care, Health for All
- Health problems: Communicable disease problems, non-communicable disease problems, Environmental sanitation
- Health care systems: Primary health care in India (Village level, Sub-centre level, Primary health centre level, Community health centres)

### 2. Occupational Health

- Concept of health: Determinants and various dimentions
- Definition and objectives of occupational health
- Occupational environment
- Occupational hazards (Physical, Chemical, Biological and Psychological)
- Occupational Diseases (Silicosis, Asbestosis, Lead-poisoning, Occupational cancer)
- Health problems due to industrialization
- Measures for health protection of workers: Nutrition, Communicable disease control, Environmental sanitation, Measures for women and children, Health education
- Prevention of occupational diseases, Engineering Measures

- Legislation: The Factories Act, 1948; The Employee`s State Insurance Act

**3. Family planning and health education:**

- Concept of family planning, Health aspect of family planning
- Contraceptive methods (Concept, Advantages and disadvantages): Spacing methods (Barrier, IUD, Hormonal, Post-conceptional), Terminal method (Male sterilization, Female sterilization)

**4. Health Education Aspect:**

- Definition and objectives of health education
- Alma-Ata Declaration
- Approaches of health education: Regulatory, Service, Health education, Primary health care approach,
- Role of health care providers
- Models of health education: Medical model, motivational model, Social intervention model
- Contents of health education: Human biology, Nutrition, Hygiene, Family health health, Disease prevention and control, prevention of accidents and use of health services
- Principles of health education
- Practice of health education

**5. Role of Dietitians:**

- Types of dietitians and role of dietitian.

**6. Health planning and management:**

- Brief idea on health planning, different health planning committee and their recommendation.
- Concept on National health policy, Population policy and Nutritional policy.
- Techniques and methods of management (organizational design, communication and information systems, cost-benefit analysis, cost effective analysis, cost accounting, network analysis- Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM).

**Suggested readings:**


- Park's Textbook of Preventive and social medicine (K. Park).
- Jalihal KA & Veerabhadraiah V. 2007. Fundamentals of Extension Education and Management in Extension. Concept Publ.
- Van Den Ban AW & Hawkins HS. 1998. Agricultural Extension .2nd Ed. CBS.
- Rural Sociology: Dr. Kumar, Lakshmi Narain Agrwal, Educational Pubilsher, Anupam Plaza-I, Block No. 50, Sanjay Place, Agra-2.
- Mushroom Growing, S.C. Day, Agrobios India.
- Mushroom and their Cultivation Technique, R. C. Ram, Aavishkar Publishers, Distibutors, Jaipur,India.
- Vermiculture and Organic Farming, T. V. Sathe, Daya Publishing House, New Delhi. Handbook of Beekeeping: Dharm Singh/ Devendra Pratap Singh, Agrobios, India.

# LIST OF INTERDISCIPLINARY/ MULTIDISCIPLINARY COURSE (IDC/MDC)

| Semester No | Course No | Course Title |
|---|---|---|
| I | IDC 1 | NUTRITION AND COMMUNITY HEALTH |
| II | IDC 2 | MATERNAL NUTRITION |
| III | IDC 3 | CHILD NUTRITION AND CHILD CARE |

## SEMESTER-I

### IDC 1: NUTRITION AND COMMUNITY HEALTH

**[TOTAL CREDITS: 3 (THEORY-2, TUTORIAL-1)]**

## Course Outcome:

The students will have a basic concept on food, nutrition and health. The student will be able to understand the importance of food components like proteins, carbohydrates and lipids. They will have fundamental concept about various food commodities. The students will be able to understand the fundamentals of Nutrition, food and health. They will be familiarized with the importance of nutrition during various stages of life. They will have a sound knowledge regarding epidemiology and management of nutritional disorders, obesity, hypertension and coronary heart disease, diabetes and also some viral, bacterial and protozoan diseases. Students will have a knowledge on National Nutrition Policy and Programmes.

1. **Basic concept of Food, Nutrition and Community health**
   - Definition of food, balanced diet, staple food, energy rich foods, body building foods, protective foods, nutrients, nutrition, malnutrition, undernutrition, overnutrition, health, community health and hygiene
   - Understanding relationship between food, nutrition and health
   - Functions of food: physiological, psychological and social
   - Basic concept of a disease: epidemic, endemic, pandemic, acute and chronic, communicable and non-communicable, infectious, contagious and zoonotic
   - Rate of a disease in a population: attack rate, mortality and morbidity rate, prevalence and incidence of a disease
2. **Nutrients**

   Functions, dietary sources and clinical manifestations of deficiency/ excess of the following nutrients:
   - Carbohydrates, lipids and proteins
   - Fat soluble vitamins-A, D, E and K
   - Water soluble vitamins – Thiamine, riboflavin, niacin, pyridoxine,

folate, Vitamin B12 and Vitamin C
- Minerals – calcium, iron and iodine

3. **Nutritional importance of Food Groups**
   - Cereals, Pulses, Fruits and vegetables, Milk & milk products, Eggs, Meat, Fish
   - Beverages: Tea, coffee, Fruit based beverages
4. **Public Health Nutrition and Diet Therapy:**
   Epidemiology, prevalence, clinical features and preventive strategies of:
   - Protein Energy Malnutrition (PEM), Vitamin A Deficiency (VAD), Iron Deficiency Anaemia (IDA), Iodine Deficiency Disorders (IDD), Fluorosis
   - Epidemiology, risk-factors, prevalence, clinical features, preventive strategies and diet therapy of: Obesity, Hypertension and Coronary Heart Disease, Type 1 and Type 2 Diabetes Mellitus
   - Epidemiology, risk-factors, prevalence, clinical features and preventive strategies and diet therapy of: GI Tract Disorders (Diarrhoea, Constipation), Liver (Infective Hepatitis)
   - National Nutrition Policy and Programmes: Integrated Child Development Services (ICDS) Scheme, Mid-day Meal Programme (MDMP), National programmes for prevention of Anaemia, Vitamin A deficiency, Iodine Deficiency Disorders.

**Suggested Readings:**


- Mudambi, SR and Rajagopal, MV. Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed; 2012; New Age International Publishers
- Mudambi, SR, Rao SM and Rajagopal, MV. Food Science; Second Ed; 2006; New Age International Publishers
- Srilakshmi B. Nutrition Science; 2012; New Age International (P) Ltd.
- Srilakshmi B. Food Science; Fourth Ed; 2010; New Age International (P) Ltd.
- Swaminathan M. Handbook of Foods and Nutrition; Fifth Ed; 1986; BAPPCO.
- Bamji MS, Rao NP, and Reddy V. Text Book of Human Nutrition; 2009; Oxford & IBH Publishing Co. Pvt Ltd.
- Wardlaw GM, Hampl JS. Perspectives in Nutrition; Seventh Ed; 2007; McGraw Hill.
- Lakra P, Singh MD. Textbook of Nutrition and Health; First Ed; 2008; Academic Excellence.
- Manay MS, Shadaksharaswamy. Food-Facts and Principles; 2004; New Age International (P) Ltd.
- Potter NN, Hotchkiss JH. Food Science; Fifth Ed; 2006; CBS Publishers and Distributors.
- Sethi P and Lakra P AahaarVigyaan,PoshanEvamSuruksha, Elite Publishing House, 2015
- Jain P et al. Poshanvaswasthyakemoolsiddhant (Hindi); First Ed; 2007; AcadamicPratibha.

- Vrinda S. AaharVigyan (Hindi); 2003; ShyamPrakashan
- Suri S. and Malhotra A. Food Science, Nutrition & Food Safety Pearson India Ltd. 2014


# SEMESTER - II

## IDC 2: MATERNAL NUTRITION

**[TOTAL CREDITS: 3 (THEORY-2, TUTORIAL-1)]**

## Course outcome:

Students will have sound knowledge on healthy diets of Indian Pregnant women and key nutrients during pregnancy. Students will be able to identify nutrition-related health issues among females of reproductive age that can affect their ability to conceive and that affect maternal and foetal outcomes of pregnancy. They will be able to describe appropriate weight gain for women during pregnancy including total and rate of gain as well as promising practices for achieving an appropriate gestational weight gain. The students will be able to identify the role of nutrition in preventing and treating nutrition-related issues during pregnancy, such as gestational diabetes, hypertensive disorders and iron deficiency anaemia.

**1. Health Care during Pregnancy:**

- Pregnancy trimester and hormonal regulation
- Growth of foetus
- Antenatal Care-Meaning and Purpose
- Psychological and Physiological changes (fluid balance, circulatory, respiratory, digestive, urinary, skeletal, skin and reproductive system changes, weight gain) during pregnancy
- Immunization during pregnancy

**2. Health Issues and Advice:**

- Physiological complications during pregnancy, Ectopic pregnancy
- Sign and symptoms: Morning sickness, Backache, Varicose veins, Leg cramps, Palpitation, Shortness of breath, Constipation, Itching in the genital area, Swollen hands and feet, Mood extremes
- Gestational diabetes, Pregnancy induced hypertension (PIH), Thyroidism
- Toxoplasmosis
- Women with alcohol or drug addiction or eating disorders

**3. Anaemia in Pregnancy**

- Nutritional Anaemia- Iron, Folic acid and Vit $B_{12}$ deficiency anaemia
- Parasitic Infestation, Sickle cell anaemia and Thalassemia
- Consequences of anaemia, Prevention- Therapeutic and Govt. Initiatives (Supplementary Feeding)

**4. Nutrition for pregnant and Nursing Mother:**

- Physiology of Pregnancy and lactation
- Nutritional demands, RDA
- Food selection during Pregnancy and Lactation

- Dietary management and meal planning
- Low-cost nutritional diet planning

**5. Family planning and maternal health:**

- Concept of family planning, Health aspect of family planning
- Contraceptive methods (Concept, Advantages and disadvantages): Spacing methods (Barrier, IUD, Hormonal, Post-conceptional), Terminal method (Male sterilization, Female sterilization)

**6. Maternal nutrition policies and programmes.**

**Suggested Readings:**


- ❖ Wadhwa A and Sharma S (2003). Nutrition in the Community-A Textbook. Elite Publishing House Pvt. Ltd. New Delhi.
- ❖ Park K (2011). Park's Textbook of Preventive and Social Medicine, 21st Edition. M/s BanarasidasBhanot Publishers, Jabalpur, India.
- ❖ Bamji MS, Krishnaswamy K and Brahmam GNV (Eds) (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.


# SEMESTER-III

## IDC 3: CHILD NUTRITION AND CHILD CARE

**[TOTAL CREDITS: 3 (THEORY-2, TUTORIAL-1)]**

## Course Outcome:

In children, nutrition, growth and development are intricately inter-linked aberrations of one aspect tend to significantly influence the others.The students will have a fundamental concept on the benefits and limitations of breastmilk vs. infant formula for postpartum women and their infants, including short- and long-term health risks, with an emphasis on breastfeeding promotion strategies. They will able to describe the process of introducing solid foods for infants, including developmental cues, types of foods introduced and timing of food introductions, with an emphasis on how the introduction of foods may affect health issues such as risk for obesity and food allergies. Students will have a knowledge on the relationships between food intake, psychosocial development and physiological needs among children and how these factors affect food choices, nutritional needs, obesity and health. They will be able identify nutrition education and health promotion concepts, interventions, strategies and resources pertinent to child.

**1. Nutrition during Infancy**

- Breast feeding- importance, stages of breast milk
- Formula feeding
- Weaning, supplementary foods

- LBW babies-Types (Preterm, SFD), feeding problems
- Nutrient needs, RDA and Balanced diet planning

**2. Nutrition during Early Childhood:**

- Toddler and Preschooler- concept, RDA, meal planning

**3. Infancy and Preschool year's development:**

- Physical and Motor development
- Social and Emotional development
- Cognitive and Language development

**4. Nutrition Related Disorders in Early Childhood:**

- PEM, Xeropthalmia, Anaemia, Iodine deficiency disorders, Rickets, Scurvy, Fluorosis
- Other problems- Dental caries, Constipation, Diarrhoea
- Diabetes Mellitus, Obesity

**5. Infant and Child Care:**

- Newborn Care at Birth- Provision of warmth, umbilical cord, skin and eye care
- Anthropometric measurements, Growth monitoring and assessment
- Immunization
- Food supplementation programmes- ICDS, MDM
- Steps and Policies of 'Baby Friendly Hospital Initiative' (BFHI)

6. **Diet for infants from Six month to one year**

**7. Diet for children between 1 to 5 years**

**Suggested Readings:**


- Wadhwa A and Sharma S (2003). Nutrition in the Community-A Textbook. Elite Publishing House Pvt. Ltd. New Delhi.
- Park K (2011). Park's Textbook of Preventive and Social Medicine, 21st Edition. M/s BanarasidasBhanot Publishers, Jabalpur, India.
- Bamji MS, Krishnaswamy K and Brahmam GNV (Eds) (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.