



MALLAREDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED HEALTH CARE SCIENCES AND TECHNOLOGY

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Jeedimetla, Hyderabad-
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Program

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

2026

VISION

To develop skilled nutrition professionals for promoting health and disease prevention.

MISSION

- Provide quality education in clinical nutrition and dietetics
- Develop practical and research skills
- Promote ethical and professional practice

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- Apply nutrition knowledge in healthcare settings
- Provide diet-based solutions for health problems
- Engage in lifelong learning and professional growth

PROGRAM OUTCOMES (POs)

- Understand nutrition and its role in health
- Assess nutritional status and plan diets
- Communicate effectively in professional settings

PROGRAM SPECIFIC OUTCOMES (PSOs)

- Plan balanced and therapeutic diets
- Manage nutrition-related disorders
- Apply food safety and hygiene principles

COURSE OUTCOMES (COs)

- Understand basic nutrition concepts
- Apply diet planning skills
- Analyze nutritional needs in health and disease

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

Curriculum & Course Structure

First Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	Max marks		TOTAL
					INT	EXT	
BND 101	Fundamentals of Nutrition	3	1	4	30	70	100
BND 102	Human Anatomy and Physiology	3	1	4	30	70	100
BND 103	Basics of Food Science	3	1	4	30	70	100
BND 104	Environmental Science	3	1	4	30	70	100
BND 105	Indian Knowledge System on Foods	2	-	2	30	70	100
BND 106	Computer Literacy	-	2	2	30	70	100
BND 107	English for Communication	2	-	2	30	70	100
VAC	Professionalism and values	2	-	2	100	-	100
TOTAL		18	6	24	310	490	800

Second Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	Max marks		Total
					INT	EXT	
BND 201	Food Microbiology	3	1	4	30	70	100
BND 202	Fundamentals of Biochemistry	3	1	4	30	70	100
BND 203	Nutrition Through Life Cycle	2	2	4	30	70	100
BND 204	Psychology and Sociology Applied to Health Care	4	-	4	30	70	100
BND 205	Techniques of Nutritional Assessment	-	2	2	30	70	100
BND 206	Soft Skills and Communication	2	-	2	30	70	100
BND 207	Computer Literacy for Nutrition	-	2	2	30	70	100
VAC	Stress Management	1	-	1	100	-	100
TOTAL		15	8	23	310	490	800

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

Third Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 301	Macronutrients in Human Nutrition	4	-	4	30	70	100
BND 302	Advanced Food Science	3	1	4	30	70	100
BND 303	Public Health Nutrition	3	1	4	30	70	100
BND 304	Basics of Medical Nutrition Therapy	2	2	4	30	70	100
BND 305	Advanced Biochemistry	3	-	3	30	70	100
BND 306	Food Processing and Preservation	2	1	3	30	70	100
VAC	Health and Well being	2	-	2	100	-	100
TOTAL		19	5	24	280	420	700

Fourth Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 401	Clinical Biochemistry and Pathophysiology	3	1	4	30	70	100
BND 402	National Health and Nutrition Programs and Policies	3	1	4	30	70	100
BND 403	Micronutrients in Human Nutrition	4	-	4	30	70	100
BND 404	Functional Foods and Nutraceuticals	3	1	4	30	70	100
BND 405	Advanced Dietetics	3	1	4	30	70	100
BND 406	Food Safety and Standards	2	-	2	30	70	100
VAC	Environmental Awareness	2	-	2	100	-	100
TOTAL		20	4	24	280	420	700

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Fifth Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 501	Research Methodology and Statistics	4	-	4	30	70	100
BND 502	Sports Nutrition	2	2	4	30	70	100
BND 503	Tools and Techniques for Nutrition Counselling	1	3	4	30	70	100
BND 504	Nutritional Epidemiology and Anthropology	3	1	4	30	70	100
BND 505	Food Analysis	2	2	4	30	70	100
BND 506	Emerging Concepts in Nutrition and Dietetics	2	-	2	30	70	100
VAC	Interpersonal communication	1	-	1	100	-	100
TOTAL		15	8	23	280	420	700

Sixth Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 601	Social Behaviour Change Communication / Nutrition Health Promotion	3	1	4	30	70	100
BND 602	Sustainable Food Systems	3	1	4	30	70	100
BND 603	Field Practice in Public Health and Nutrition	1	3	4	30	70	100
BND 604	Food Product Development	2	4	6	30	70	100
BND 605	Case Study Reviews	-	4	4	30	70	100
VAC	Soft skill development	1	-	1	100	-	100
TOTAL		10	13	23	250	350	600

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Seventh Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 701	Information Technology in Nutrition and Dietetics	2	2	4	30	70	100
BND 702	Entrepreneurship in Nutrition and Dietetics	3	1	4	30	70	100
BND 703	Nutrition in Critically Ill	2	2	4	30	70	100
BND 704	Management and Administration in Dietetics Services	2	2	4	30	70	100
BND 705	Nutrition in Emergencies	2	-	2	30	70	100
BND 706	Applied Dietetics / Internship Project	-	4	4	100	-	100
TOTAL		10	11	22	250	350	600

Eighth Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 801	Internship in Hospital / Experiential Learning	-	14	14	100	-	100
BND 802	Research and Trends in Nutrition and Dietetics	-	4	4	30	70	100
BND 803	Scientific Writing in Nutrition and Dietetics	-	4	4	30	70	100
TOTAL		-	22	22	160	140	300

UNDERGRADUATE PROGRAMME

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

This is a 4-year degree program that teaches students how food and nutrition affect health. It trains students to become dietitians and nutrition experts who help people stay healthy, prevent diseases, and manage medical conditions through diet.

Eligibility for admission:

Students must:

- Pass 10+2 with Physics, Chemistry, Biology/Math
- Score at least 50% marks
- Qualify entrance exam (like NEET or equivalent)
- Be at least 17 years old

Course duration:

- 4 years (8 semesters)
- Includes internship
- Total training hours: 3735 (theory + practical + internship)

Rules of study:

- English is the medium of instruction
- Minimum attendance:
 - 75% in theory
 - 80% in practical training

Assessment:

Students are evaluated based on:

- Theory exams
- Practical/clinical performance
- Continuous performance during training

Key skills developed:

- Communication skills
- Professional behavior
- Patient care and counseling

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- Proper documentation.

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BND 102	Human Anatomy and Physiology	3	1	4	30	70	100
BND 103	Basics of Food Science	3	1	4	30	70	100
BND 104	Environmental Science	3	1	4	30	70	100
BND 105	Indian Knowledge System on Foods	2	-	2	30	70	100
BND 106	Computer Literacy	-	2	2	30	70	100
BND 107	English for Communication	2	-	2	30	70	100
VAC	Professionalism and values	2	-	2	100	-	100
TOTAL		18	6	24	310	490	800

BND 101 Fundamentals of Nutrition

L-3/T/P-1/C-4

Course Outcomes

- Explain the basic principles and concepts of nutrition
- Identify the functions and sources of macro and micronutrients
- Apply nutritional knowledge for maintaining health and preventing deficiencies

Program Outcomes

- Develop foundational knowledge in nutrition sciences
- Promote healthy dietary practices and lifestyle management
- Strengthen analytical skills in nutritional evaluation

Learning Objectives

- To understand the fundamentals of human nutrition
- To study nutrients, their functions, and dietary sources
- To familiarize students with balanced diet concepts and nutritional requirements

Learning Outcomes

- Describe the role of nutrients in human health

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- Plan balanced diets for different age groups
- Identify nutritional deficiency disorders and preventive measures

SYLLABUS

Unit 1

(9 Hours)

Basic Concept of Food and Nutrition: Introduction to nutrition- definition of food, nutrition, nutrients, and health, functions of food, food groups classification, Food pyramid, My Plate and dietary guidelines, Recommended Dietary Allowances (RDAs), Balanced diet (ICMR-NIN)

Unit 2

(9 Hours)

Composition, Classification, Functions, dietary sources, and clinical manifestations of deficiency/ excess of the following nutrients/non nutrients: Carbohydrates, lipids, protein, water, fiber

Unit 3

(9 Hours)

Classification, Functions, dietary sources, and clinical manifestations of deficiency/ excess of the following nutrients: Fat soluble vitamins Vitamin A, D, E, K and Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C

Unit 4

(9 Hours)

Classification, Functions, dietary sources, and clinical manifestations of deficiency/ excess of the following nutrients Macro minerals- Calcium, potassium, Phosphorous, Chlorine, Sulfur, Magnesium, Micro Minerals – iron, zinc, selenium, copper, manganese

Unit 5

(9 Hours)

Introduction to different culinary terms Boiling, Simmering, Poaching, Steaming, Pressure cooking Grilling, broiling, roasting, Baking, Sautéing, Shallow fat frying, Deep fat frying, Combined (Moist and dry) Methods: Braising, Stewing Germination, Fermentation, Braising, Microwave cooking, Solar cooking

PRACTICAL

Unit 1

(6 Hours)

Market survey of locally available food items viz. cereals, pulses, fruits and vegetables, milk and milk products, fats and oils, nuts and oilseeds, sugar and jaggery, meat, fish, and poultry and miscellaneous food items like biscuits, jams, jellies, ketchup etc. and their cost.

Unit 2

(6 Hours)

Classify foods on the basis of nutrients: Protein, Iron, Calcium, Vitamin A, Vitamin C (list of 10 foods with highest and lowest amount of these nutrients- Plant and animals sources)

Calculate the cost of food required for providing a given amount of nutrient for an adult man/woman as per RDA/EAR for each food group : cereals, pulses, fruits and vegetables, milk and milk products, fats and oils, nuts and oilseeds, sugar and jaggery, meat, fish, and poultry

Unit 3

(6 Hours)

Overview of Controlling techniques and Food exchange system

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Controlling techniques: Weights and measures - standard and household measures for raw and cooked foods (metric)

Food exchange system and its applications.

Unit 4

(6 Hours)

Standardization of basic food preparations

Beverages: Tea, coffee, cocoa, fruit juice, milk shakes and smoothies

Cereal and flour mixtures: Basic preparations - boiled rice & rice, pulao; chapati, puri, paratha, sandwiches, pastas

Pulses and legumes: Using whole, split and sprouted

Unit 5

(6 Hours)

Standardization of basic food preparations Nuts and oilseeds: Chikki, laddoo

Vegetables: Simple salad, dry and gravy vegetable

Fruits: Fruit preparations using fresh fruits - jam, squash, fruit salad

Milk and products: Milk porridge – dalia; curd, paneer and their commonly made preparations- butter milk, lassi, shrikhand;

Milk based simple desserts and puddings - custards, kheer, ice-cream

Egg : Hard and soft boiled, poached, scrambled, fried, omelette, eggnog

Soups : Basic, clear and cream soups

Snacks :Pakorais, upma, pohe

Reference Books

- DieteticsSrilakshmi, B. (2023). *Dietetics* (9th ed.). New Age Publishers. ISBN: 9789395161848.
- Dietary Guidelines for IndiansICMR–National Institute of Nutrition. (2024). *Dietary Guidelines for Indians: A Manual* (Revised ed.). Hyderabad.
- Fundamentals of Foods, Nutrition and Diet TherapyMudambi, S. R. (2007). *Fundamentals of Foods, Nutrition and Diet Therapy*. New Age International Pvt. Ltd. ISBN: 9788122433494.
- Textbook of Human NutritionBamji, M. S., Krishnaswamy, K., &Brahmam, G. N. V. (Eds.). (2016). *Textbook of Human Nutrition*. Oxford & IBH Publishing. ISBN: 9788120417908.
- Textbook of Food Science and NutritionChowdhury, S. R., &TamberAeri, B. *Textbook of Food Science and Nutrition*. Kindle Edition.
- Food Facts and PrinciplesShadaksharaswamy, M., &Manay, S. (2010). *Food Facts and Principles* (3rd ed.). New Age International Publishers. ISBN: 9789395161091.
- Food Processing and PreservationSubbulakshmi, G., Udipi, S. A., &Ghurge, P. A. (2021). *Food Processing and Preservation*. New Age International Publishers. ISBN: 9788122472332.

Webliography

- [Coursera – Food and Health Course](#)

- Nutrition.gov
- [World Health Organization – Nutrition](http://WorldHealthOrganization.org)

BND 102 Human Anatomy and Physiology

L-3/T/P-1/C-4

Course Outcomes

- Explain the structure and functions of human body systems
- Relate physiological processes to health and nutrition
- Interpret the role of body systems in maintaining homeostasis

Program Outcomes

- Build strong biomedical science foundations for nutrition practice
- Enhance understanding of body functions related to health care
- Support clinical and dietetic applications through physiological knowledge

Learning Objectives

- To understand the anatomy of major body systems
- To study physiological functions and regulatory mechanisms
- To correlate anatomy and physiology with nutrition and health

Learning Outcomes

- Identify structures and functions of body organs and systems
- Explain physiological processes involved in body functioning
- Relate nutrition with normal body metabolism and health maintenance

SYLLABUS

Unit I: Introduction to Human Anatomy and Physiology

9 Hours

- Definition and scope of human anatomy and physiology
- Relevance of anatomy and physiology for dietitians and nutritionists
- Anatomical positioning of organs in the human body
- Concept of homeostasis and its relevance
- Cell structure and functions
- Structure and functions of nucleus, cytoplasm, lysosomes, endoplasmic reticulum, Golgi apparatus, mitochondria, and cell membrane
- Transport across cell membrane: active and passive transport
- Body fluids: compartments and functions
- Cellular growth, mitosis, and meiosis
- Tissues: classification, structure, and functions
- Body fat and water percentage across the life cycle and their relevance to health

Unit II: Musculoskeletal and Respiratory Systems

9 Hours

- Musculoskeletal system: structure and functions of bones, cartilage, connective tissue, and muscle fibers
- Types, structure, and functions of muscles
- Bone health and changes in bone mass during aging
- Osteoporosis
- Respiratory system: structure and functions of organs of respiration
- Mechanism of respiration
- Pulmonary ventilation, external and internal respiration
- Role of hemoglobin in respiration
- Regulation of respiration: nervous and chemical control
- Respiratory function tests, lung volumes, and capacities

Unit III: Digestive and Excretory Systems

9 Hours

- Digestive system: structure and functions of organs of the gastrointestinal tract
- Oral cavity, oesophagus, stomach, small intestine, large intestine, colon, pancreas, liver, and gall bladder
- Role of liver, gall bladder, and pancreas in digestion
- Enzymes and hormones of the gastrointestinal tract
- Role of gut microbiota
- Digestion and absorption processes
- Gut–brain connection
- Excretory system: anatomy and physiology of kidneys, ureter, and urinary bladder
- Structure and function of nephron
- Glomerular filtration rate and urine formation
- Normal and abnormal constituents of urine

Unit IV: Circulatory, Endocrine, and Immune Systems

9 Hours

- Circulatory system: structure and function of heart and blood vessels
- Capillary exchange and regulation of cardiac output
- Cardiac cycle and blood pressure regulation
- Systemic, hepatic portal, and pulmonary circulation
- Interstitial fluid and lymph
- Blood constituents: erythrocytes, leucocytes, thrombocytes, and plasma
- Blood coagulation and blood groups
- Endocrine system: structure, mode of action, and physiological functions of pituitary, thyroid, parathyroid, adrenal, and reproductive hormones
- Basic principles of immunology
- Immunity and its types
- Immunoglobulins: types, structure, and functions

- T-cells and B-cells: structure and functions
- Humoral and cell-mediated immunity
- Role of nutrition in immunity

Unit V: Thermoregulation and Reproductive System

9 Hours

- Regulation of body temperature
- Thermogenesis, thermolysis, pyrexia, and hypothermia
- Role of skin in maintaining body temperature
- Homeostasis and its relevance
- Male reproductive system: anatomy and physiology
- Female reproductive system: anatomy and physiology
- Structure and functions of reproductive organs and hormones
- Menarche, menstruation, and ovarian cycles
- Pregnancy: conception and three trimesters
- Parturition and lactation
- Menopause

Practical

30 Hours

1. Respiratory System: Spirometry, Breath holding test, Use of Respirometer to estimate respiratory quotient
2. Cardiovascular System: Measurement of blood pressure and pulse rate, Effect of exercise on blood pressure and pulse rate
3. Blood test: Demonstration: Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count
4. Blood test: Demonstration : Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count
5. Digestion: Test salivary digestion
6. Excretion: Examination of Urine, Specific gravity, Albumin, Sugar, Microscopic examination for cells and cysts First aid medical skills like CPR, how to measure Blood Pressure

Reference Books

- Principles of Anatomy and Physiology Tortora, G. J., & Derrickson, B. H. (2017). *Principles of Anatomy and Physiology* (15th ed.). John Wiley & Sons. ISBN: 1119400066.
- Ross & Wilson Anatomy and Physiology in Health and Illness Waugh, A., & Grant, A. (2022). *Ross & Wilson Anatomy and Physiology in Health and Illness* (14th ed.). Elsevier Health Sciences. ISBN: 0323834612.
- Gray's Anatomy Standring, S. (2020). *Gray's Anatomy: The Anatomical Basis of Clinical Practice* (42nd ed.). Elsevier. ISBN: 0702077054.

Webliography

- Coursera – Introductory Human Physiology by Duke University Carbrey, J., & Jakoi, E. (2024). *Introductory Human Physiology*. Duke University. Available on Coursera.

BND 103 Basics of Food Science

L-3/T/P-1/C

Course Outcomes

- Understand the composition and functions of foods.
- Explain methods of food preparation and preservation.
- Identify factors affecting food quality and safety.

Program Outcomes

- Apply food science principles in nutrition practice.
- Promote safe and healthy food habits.
- Develop knowledge in food processing and storage.

Learning Objectives

- To study the basics of food composition.
- To understand food preparation techniques.
- To learn food preservation methods.

Learning Outcomes

- Describe different food groups and nutrients.
- Demonstrate knowledge of food safety practices.
- Analyze the effect of cooking on nutrients.

SYLLABUS

Unit 1

(9 Hours)

Function of Foods and classification of Food groups; Cooking Techniques – Dry heat and Moisture heat techniques, Combination techniques, Techniques using fat as cooking medium. Fruit & Vegetable Preservation – Pickling, Preservation with high concentration of sugar – jam, jelly, candied fruit, Dehydration of fruits and vegetables, Concentration – Tomato sauce, Canning of acid and non-acid foods, Freezing, Chemical Preservation.

Unit 2

(9 Hours)

Cereals: Structure and Composition of Rice, Wheat, and Millets. Effect of cooking on starch- Dextrinization, gelatinization, factors affecting Gel strength and Retrogradation; Primary processing of cereals and Millets – Drying and Milling of cereals and millets, Byproducts; Value-added products like pasta, noodles, multigrain flours, and RTE mixes Pulses: structure

Composition of Pulses and Nutritive value of various pulses; Cooking study of pulses with different cooking media; Germination process and factors affecting germination; processing of fermented products from pulses like soybean

Unit 3

(9 Hours)

Milk– Milk composition and nutritive value; Homogenization, Pasteurization of milk, types of pasteurization and effect on nutritive value, UHT; Milk Products – Flavored milk, Ice cream, Cheese and Milk powders; Preparation of Indigenous milk products - channa, paneer, Sandesh, Rasogolla and Khoa

Unit 4

(9 Hours)

Eggs and Poultry: Structure of an egg; Composition and Nutritive value of eggs; functional properties of egg and cooking of eggs – green ring formation; preparation of egg powders; Nutritive value of poultry meat; Dressing of a poultry bird and cuts of poultry

Meat – Structure of muscle, Composition and nutritive value of meat, Classes of meat, Slaughter and steps in slaughtering of animals, Postmortem changes of meat, factors affecting cooking quality of meat – Juiciness, marbling, flavor and tenderness; Meat cooking techniques; Meat emulsion and value added meat products

Unit 5

(9 Hours)

Spices and Condiments: Roles of spices and condiments in cooking; health benefits and types of spices & herbs; Essential oils ,fixed oil and oleoresins; Primary processing of spices – Sterilization of spices; milling of spices and cryogenic grinding of spices; Curry Powders

Oils and Fats: Types of fats and oils; Smoking oils, Physical and chemical properties of oils- FFA, Iodine value, saponification, Reichert-Miessl value, fat emulsification and emulsifiers; Factors affecting absorption of oils; Processing of oils- Oil extraction, Refining of oils and Fractionation of oils; hydrogenated fats, Mayonnaise and specialty fats

Sensory Evaluation of Foods: Types of sensory organs, Perception of sensory response , Basic tastes, Preparation of sensory card using various methods.

PRACTICAL

(30 Hours)

1. Cooking methods Moist heat methods –
 - i. Boiling, simmering, steaming & Pressure cooking
 - ii. Dry heat methods – baking.
 - iii. Fat as a medium for Cooking - shallow and deep fat frying.
2. Studying Temperature of gelatinization in different cereal and millet starches and gel Strength
3. Cooking of soaked and unsoaked pulses
4. Common preparations with pulses – Composite mixes and malts
5. Processing of vegetables- Fermentation and Pickling
6. Prevention of darkening in fruits & vegetables
7. Preservation of fruits - Jam, Jelly and Candied fruit
8. Preservation of fruits – Dehydration of fruits and vegetables
9. Processing of Milk & milk products – Paneer and Cheese.

10. Processing of Milk & milk products - Common preparation indigenous milk sweets like Channa based Rasogolla and Sandesh
11. Processing of Flesh foods: meat & poultry- preparations like pickling and value added products – nugget , meat loaf and meat balls.
12. Processing of Flesh foods: Fish and shrimp – preparations like battered shrimp, Pickled fish & shrimp; fish wafers and fingers
13. Egg Experimental cookery- boiled egg, poached egg. Common preparations with eggs.
14. Sensory Evaluation and preparation of score card

Reference Books

- Food Science, Chemistry and Experimental Foods Swaminathan, M. S. (1987). *Food Science, Chemistry and Experimental Foods* (2nd ed.). Bappco Publishers.
- Food Science Potter, N. N. (2007). *Food Science* (5th ed.). CBS Publishers.
- Experimental Study of Foods Griswold, R. M. (1962; Digitized ed. 2008). *Experimental Study of Foods*. Houghton Mifflin Publishers.
- Modern Cookery for Teaching and Trade Philip, T. (1965; Digitized ed. 2006). *Modern Cookery for Teaching and Trade* (Vol. I & II). Orient Longmans Ltd. ISBN: 8125025189, 9788125025184.
- Food Fundamentals McWilliams, M. (2013). *Food Fundamentals* (10th ed.). Pearson Education. ISBN: 1292054409, 978129205407.
- Food Facts and Principles Manay, S., & Shadaksharaswamy, M. (2008). *Food Facts & Principles* (Reprint ed.). New Age International. ISBN: 8122422152.
- Food Science Srilakshmi, B. (2018). *Food Science* (7th ed.). New Age International (P) Ltd. ISBN: 9789386418890.

BND 104 Environmental Science

L-2/T/P/C-2

Course Outcomes

- Explain environmental concepts and ecosystem functions
- Assess environmental issues affecting human health and nutrition
- Promote sustainable environmental practices and resource conservation

Program Outcomes

- Develop environmental awareness and responsibility
- Encourage sustainable approaches in food and nutrition systems
- Strengthen understanding of environmental health relationships

Learning Objectives

- To understand basic environmental science concepts
- To study environmental pollution and its health impact

- To create awareness regarding conservation and sustainability

Learning Outcomes

- Identify major environmental challenges and their consequences
- Explain the relationship between environment and public health
- Practice environmentally sustainable behaviors and strategies

SYLLABUS

Unit I: Introduction to Environmental Studies and Natural Resources

6 Hours

- Multidisciplinary nature, definition, scope, and importance of environmental studies
- Natural resources: renewable and non-renewable resources
- Forest resources: use, over-exploitation, deforestation, timber extraction, mining, and dams
- Effects of forest exploitation on environment and tribal populations
- Water resources: use and over-utilization of surface and groundwater
- Floods, droughts, water conflicts, and dams: benefits and problems
- Mineral resources: use, exploitation, and environmental effects
- Food resources: global food problems, effects of modern agriculture, overgrazing, fertilizer and pesticide problems, water logging, and salinity

Unit II: Energy Resources and Ecosystems

6 Hours

- Energy resources: growing energy needs
- Renewable and non-renewable energy resources
- Alternate energy sources and sustainable energy use
- Land resources: land degradation, soil erosion, desertification, and landslides
- Role of individuals in conservation of natural resources
- Sustainable lifestyles and equitable resource utilization
- Ecosystem: concept, structure, and functions
- Producers, consumers, decomposers, and energy flow in ecosystems
- Ecological succession, food chains, food webs, and ecological pyramids
- Types of ecosystems: forest, grassland, desert, and aquatic ecosystems

Unit III: Biodiversity and Environmental Pollution

6 Hours

- Biodiversity: introduction, definition, and types
- Genetic, species, and ecosystem diversity
- Biogeographical classification of India
- Values of biodiversity: consumptive, productive, social, ethical, aesthetic, and option values

- Biodiversity at global, national, and local levels
- India as a mega-diversity nation and biodiversity hotspots
- Threats to biodiversity: habitat loss, poaching, endangered and endemic species, and man-wildlife conflicts
- In-situ and ex-situ conservation of biodiversity
- Environmental pollution: air, water, soil, marine, noise, thermal pollution, and nuclear hazards
- Solid waste management: causes, effects, and control measures
- Role of individuals in pollution prevention

Unit IV: Social Issues, Environmental Legislation, and Human Population

6 Hours

- Sustainable development and environmental ethics
- Urban problems related to energy
- Water conservation, rainwater harvesting, and watershed management
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, and holocaust
- Environmental protection acts: Air Act, Water Act, Wildlife Protection Act, and Forest Conservation Act
- Environmental legislation and public awareness
- Human population growth and population explosion
- Population variation among nations
- Role of information technology in environment and human health

Unit V: Natural Disasters and Disaster Management

6 Hours

- Natural disasters: meaning, nature, types, and effects
- Floods, droughts, cyclones, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves
- Global warming, sea level rise, and ozone depletion
- Man-made disasters: nuclear, chemical, biological, fires, and transportation accidents
- Disaster management strategies at national and global levels
- National disaster management framework and financial arrangements
- Role of NGOs, community organizations, media, administration, police, and armed forces in disaster response
- Feeding and rehabilitation during disasters
- Management of housing and clothing needs during disasters

Reference Books

- Food Processing Technology Fellows, P. J. (2017). *Food Processing Technology* (4th ed.). Woodhead Publishing Series. ISBN: 9780081019078.

- Food SciencePotter, N. N. (2007). *Food Science* (5th ed.). CBS Publishers. ISBN: 812390472X.
- Experimental Study of FoodsGriswold, R. M. (1962; Digitized ed. 2008). *Experimental Study of Foods*. Houghton Mifflin Publishers.
- Beverages: Processing and TechnologyMudgil, D., & Barak, S. (2018). *Beverages: Processing and Technology* (1st ed.). Scientific Publishers. ISBN: 9387991725, 9789387991729.
- Bakery Technology and EngineeringMatz, S. A. (2008). *Bakery Technology & Engineering* (3rd ed., Reprint). CBS Publishers India. ISBN: 0942849302.
- Food FundamentalsMcWilliams, M. (2013). *Food Fundamentals* (10th ed.). Pearson Education. ISBN: 1292054409, 978129205407.
- Extrusion CookingGuy, R. (2001). *Extrusion Cooking* (1st ed., Reprint). Elsevier. ISBN: 1855736314.
- Cocoa, Confectionery, and Chocolate ProductsMinifie, B. W. (2012). *Cocoa, Confectionery, and Chocolate Products* (3rd ed., Reprint). Springer Netherlands. ISBN: 9401179263, 9789401179263.
- Fruit and Vegetable PreservationKumar, S., & Srivastava. (2017). *Fruit and Vegetable Preservation* (3rd ed., Reprint). International Book Distributing Company. ISBN: 8123924372, 9788123924373.

BND 105 Indian Knowledge System on Foods

L-2/T/P/C-2

Course Outcomes

- Understand traditional Indian food systems.
- Explain the health benefits of indigenous foods.
- Appreciate cultural food practices of India.

Program Outcomes

- Promote traditional healthy dietary practices.
- Integrate indigenous knowledge into nutrition care.
- Preserve cultural food heritage.

Learning Objectives

- To study traditional Indian foods and diets.
- To understand Ayurvedic concepts of food.
- To learn the role of millets and local foods.

Learning Outcomes

- Explain traditional dietary principles.
- Identify therapeutic uses of Indian foods.
- Recommend healthy traditional food practices.

SYLLABUS

Unit 1

(6 Hours)

Introduction to Indian Knowledge Systems and its importance as per NEP 2020. Traditional diets and food culture (Food anthropology) and Regional diets of North India (Jammu, Kashmir, Ladakh, Punjab, Haryana, Uttarakhand) and South India (Tamil Nadu, Kerala, Andhra Pradesh, Telangana, Puducherry, Karnataka)

Unit 2

(6 Hours)

Traditional diets and food culture (Food anthropology) and Regional diets of Central India (Uttar Pradesh, Madhya Pradesh) and Western India (Gujarat, Maharashtra, Rajasthan, Goa).

Unit 3

(6 Hours)

Traditional diets and food culture (Food anthropology) and Regional diets of anthropology Regional diets of East India (West Bengal, Bihar, Odisha)

Unit 4

(6 Hours)

Traditional diets and food culture (Food anthropology) and Regional diets of North east India (Assam, Mizoram, Manipur, Meghalaya, Sikkim, Nagaland, Tripura, Arunachal Pradesh)

Unit 5

(6 Hours)

Traditional diets and food culture (Food anthropology) of specific religions of India (Muslims, Parsi, Buddhist, Sikhs and any other local communities).

Reference Books

- Indian Food Anthropology and the Eat Right Movement – Volume 1 Nambiar, V. (Ed.). (2021). *Indian Food Anthropology and the Eat Right Movement – Volume 1*. Selective & Scientific Books. ISBN: 9788195149223.
- Indian Food Anthropology and the Eat Right Movement – Volume 2 Nambiar, V. (Ed.). (2021). *Indian Food Anthropology and the Eat Right Movement – Volume 2*. Selective & Scientific Books. ISBN: 9788195149247.
- Indian Food: A Historical Companion Achaya, K. T. (1994). *Indian Food: A Historical Companion*. Oxford University Press. ISBN: 9780195634488.
- Feasts and Fasts: A History of Food in India Sen, C. T. (2014). *Feasts and Fasts: A History of Food in India*. Reaktion Books. ISBN: 9781780233529.

Webliography

- [Indian Knowledge Systems \(IKS\)](#)

- Centre for Indian Knowledge Systems (CIKS)

BND 106 COMPUTER LITERACY

L/T/P-2/C-2

Course Outcomes

- Understand basic computer applications in nutrition.
- Use digital tools for diet planning and data management.
- Develop skills in documentation and presentations.

Program Outcomes

- Apply computer skills in professional nutrition practice.
- Improve efficiency in nutritional assessment and reporting.
- Use technology for communication and research.

Learning Objectives

- To learn basics of computer operations.
- To understand MS Office applications.
- To use computers for nutrition-related tasks.

Learning Outcomes

- Prepare reports and presentations digitally.
- Use spreadsheets for dietary calculations.
- Demonstrate basic computer proficiency.

PRACTICAL

Unit 1: Fundamentals of Computers

(12 Hours)

- Introduction to computers and basic applications
- Components of a computer system:
 - Central Processing Unit (CPU)
 - Keyboard, mouse, VDU
 - Other input devices
- Computer memory.
- Concept of:

- Hardware
- Software (Application software & System software)
- Basics of computing, data, and information
- Applications of IECT (Information, Education, and Communication Technology)

Unit 2: Operating System and Basic Computer Operations

(12 Hours)

- Connecting computer components:
 - Keyboard, mouse, monitor, printer to CPU
 - Checking power supply
- Operating system:
 - Definition and basics
 - Popular operating systems
- GUI-based operations:
 - User interface
 - Using mouse (left/right click, dragging icons)
 - Common icons and status bar
 - Using menus and selections
- File management:
 - Files, folders, and directories
 - Creating, renaming, opening, and closing files/folders
 - Using help and shortcuts
- Basics of OS setup and common utilities

Unit 3: Word Processing and Spreadsheets

(12 Hours)

- **Word Processing:**
 - Basics
 - Opening and closing documents
 - Text creation and editing
 - Formatting text
 - Table handling
 - Spell check, language settings, thesaurus
 - Printing documents
- **Spreadsheets:**
 - Basics
 - Cell manipulation
 - Formulas and functions
 - Editing spreadsheets
 - Printing spreadsheets

Unit 4: Internet, Networking, and Communication

(12 Hours)

- Basics of computer networks:
 - LAN and WAN
- Internet concepts:
 - World Wide Web (WWW)
 - Web browsers
 - Browsing the internet
 - Search engines
- Technical basics:
 - URL
 - Domain name
 - IP address
- Connectivity troubleshooting
- E-governance websites
- Communication and collaboration:
 - Email (creating, sending, receiving, managing)
 - Instant messaging
 - Document collaboration
 - Netiquettes

Unit 5: Input/Output Devices and Presentations

(12 Hours)

- Input devices:
 - Keyboard
 - Pointing devices
 - Scanners
 - Optical recognition devices
 - Digital cameras
 - Voice recognition systems
 - Data acquisition sensors
 - Media input devices
- **Output devices:**
 - Monitors
 - Printers
 - Voice output systems
 - Projectors
 - Terminals
- **Presentations:**
 - Basics of presentation software
 - Creating presentations
 - Preparing slides
 - Slide show
 - Printing handouts

Reference Books

Balagurusamy E., Fundamentals of Computers (2009). Tata McGraw Hill Education Private Limited NEW DELHI ISBN 9780070141605

Webliography

1. E-Learning Material Computer Application of 1st/2nd semester of all Engineering Branches of Diploma courses of SCTE&VT, Odisha. Ajay Ku. Panda, D. Susmita, Ajit Ku. Behera, Kalpana Panigrahi, Swetalina Das, Published by SCTE&VT, Odisha, Bhubaneswar-12 <https://sctevtodisha.nic.in/en/secretarysctevt@gmail.com,material.sctevt@gmail.com>
2. Basic Applications of Computers <http://egyankosh.ac.in/handle/123456789/50864>
3. Computer Basics (Video) <http://hdl.handle.net/123456789/35766>

BND 107 English For Communication

L-2/T/P/C-2

Course Outcomes (CO)

- Develop effective verbal and written communication skills for academic, professional, and social contexts.
- Improve listening, speaking, reading, and writing abilities through practical communication activities.
- Enhance confidence in interpersonal communication, presentations, group discussions, and interviews.

Program Outcomes (PO)

- Apply communication skills effectively in professional, academic, and workplace environments.
- Demonstrate teamwork, leadership, and interpersonal skills through collaborative communication practices.
- Use appropriate language, ethics, and digital communication tools for lifelong learning and career development.

Learning Objectives

- To develop proficiency in English language communication skills.
- To strengthen vocabulary, grammar, pronunciation, and comprehension abilities.
- To train students in public speaking, presentation, report writing, and professional correspondence.

Learning Outcomes

- Students will be able to communicate clearly and confidently in English in both oral and written forms.
- Students will be able to participate effectively in discussions, seminars, interviews, and presentations.
- Students will be able to prepare professional documents such as resumes, emails, reports, and formal letters.

SYLLABUS

Unit I: Introduction to Communication

6 Hours

- Meaning, definition and significance of communication.
- Process of communication and elements of communication.
- Barriers to communication and methods to overcome them.
- Types of communication: verbal, non-verbal, written and visual communication.
- Importance of communication skills in professional and academic life.

Unit II: Reading Skills and Comprehension

6 Hours

- Reading prescribed texts, narratives and articles fluently.
- Techniques for effective reading and comprehension.
- Reading poems and prose with understanding and enjoyment.
- Vocabulary development and interpretation of texts.
- Summarizing and paraphrasing the given text.

Unit III: Writing Skills – Letter and Report Writing

6 Hours

- Principles of effective writing.
- Formal and informal letter writing.
- Business letter writing and professional correspondence.
- Report writing: structure, format and style.
- Preparation of reports on events, visits and activities using correct grammar and tense.

Unit IV: Public Speaking and Professional Communication

6 Hours

- Fundamentals of public speaking.
- Drafting various kinds of speeches.
- Preparation and delivery of vote of thanks.
- Group interaction and confident professional communication.
- Presentation skills and stage confidence.

Unit V: Listening and Pronunciation Skills

6 Hours

- Importance of listening skills in communication.
- Practice of enhanced listening skills using language lab software.
- Techniques for active and effective listening.
- Correct pronunciation with proper stress and intonation.
- Speech pacing, fluency and clarity in spoken communication.

Reference Books

1. The above said skills would be developed with the integration of Language Lab software in the English tutorials and with the help of selected texts from the book _Reflections II -An Anthology of Prose, Poetry and Fiction by Nandini Nayar (Foundation Books) ;
2. Punishment in kindergarten – A poem by Kamala Das
3. People who never took a _No‘ – Case study of Akio Morita and Henry Ford
4. The Wonders of new millennium – by Michael David

VAC- PROFESSIONALISM AND VALUES

L-2/T/P/C-2

Course Outcomes

- Apply principles of professionalism, ethics, and moral values in healthcare and nutrition practice
- Demonstrate effective communication, teamwork, and culturally sensitive behaviour in professional environments
- Recognize professional responsibilities, accountability, and ethical decision-making in clinical and community settings

Program Outcomes

- Develop professional competence, integrity, and ethical conduct required for healthcare practice
- Demonstrate leadership, collaboration, and interpersonal skills while working with multidisciplinary healthcare teams
- Promote patient-centered and culturally appropriate care through professional attitudes and values-based practice

Learning Objectives

- Understand the concepts and importance of professionalism and ethical values in healthcare professions
- Identify professional responsibilities, ethical dilemmas, and standards of conduct in nutrition and dietetics practice
- Develop skills in communication, teamwork, accountability, and culturally sensitive healthcare delivery

Learning Outcomes

- Explain the principles of professionalism, integrity, confidentiality, and ethical behaviour in professional practice
- Demonstrate respectful communication, empathy, and teamwork with patients, clients, and healthcare professionals
- Apply ethical reasoning and professional accountability while addressing challenges in healthcare environments

SYLLABUS

Unit I: Introduction to Professionalism and Professional Values

6 Hours

- Introduction to professionalism in healthcare
- Importance of professionalism in nutrition and dietetics practice
- Professional values
 - Integrity
 - Objectivity
 - Honesty and transparency
- Development of empathy towards patients, clients, coworkers, and stakeholders
- Communication skills and interpersonal relationships in professional settings

Unit II: Professional Ethics and Moral Values

6 Hours

- Ethical and moral values in healthcare professions
- Ethical decision-making in professional practice
- Recognizing ethical dilemmas and resolving ethical issues
- Respect for patients, colleagues, and healthcare teams
- Professional competence and due care
- Confidentiality and privacy in healthcare practice
- Ethical standards and norms of behaviour

Unit III: Professional Behaviour, Accountability, and Responsibility

6 Hours

- Professional attitude and behaviour
- Treating individuals equally and respectfully
- Accountability for professional decisions and actions
- Responsibility towards patients, society, and the profession
- Recognizing and correcting professional errors
- Professional misconduct and its consequences
- Maintaining discipline and ethical conduct in the workplace

Unit IV: Teamwork and Interdisciplinary Collaboration

6 Hours

- Importance of teamwork in healthcare
- Team efforts and collaborative practice
- Roles and responsibilities of different healthcare professionals
- Differences between professions in healthcare systems
- Conflict resolution and professional cooperation
- Working effectively with interdisciplinary team members
- Importance of diverse perspectives and skills in healthcare delivery

Unit V: Cultural Issues and Professional Practice in Healthcare

6 Hours

- Cultural diversity in healthcare environments
- Understanding different cultures and belief systems
- Cultural sensitivity and culturally competent care
- Adapting professional approaches to meet cultural needs
- Respect for social, cultural, and religious values
- Communication challenges in multicultural healthcare settings
- Professionalism for personal and organizational success

References

- Essentials of Professionalism, Professional Values & Ethics by Varinder Kaur
- Ethics in Science: Ethical Misconduct in Scientific Research, Second Edition by John D'Angelo
- A textbook on professional ethics and human values by R S Naagrazan

Second Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	Max marks		Total
					INT	EXT	
BND 201	Food Microbiology	3	1	4	30	70	100
BND 202	Fundamentals of Biochemistry	3	1	4	30	70	100
BND 203	Nutrition Through Life Cycle	2	2	4	30	70	100
BND 204	Psychology and Sociology Applied to Health Care	4	-	4	30	70	100
BND 205	Techniques of Nutritional Assessment	-	2	2	30	70	100
BND 206	Soft Skills and Communication	2	-	2	30	70	100
BND 207	Computer Literacy for Nutrition	-	2	2	30	70	100
VAC	Stress Management	1	-	1	100	-	100
TOTAL		15	8	23	310	490	800

BND 201 FOOD MICROBIOLOGY

L-3/T/P-1/C-4

Course Outcomes

- Understand microorganisms related to food.
- Explain food spoilage and food-borne diseases.
- Learn principles of food hygiene and sanitation.

Program Outcomes

- Apply microbiological concepts in food safety.
- Ensure hygienic food handling practices.
- Reduce risks of food contamination.

Learning Objectives

- To study useful and harmful microorganisms.
- To understand food contamination.
- To learn methods of food preservation.

Learning Outcomes

- Identify common food microorganisms.
- Explain causes of food spoilage.
- Practice safe food handling methods.

SYLLABUS

Unit 1: Basics of Microbiology

(9 Hours)

- Introduction to Microbiology
- Importance of microbiology for dieticians (with recent examples)
- Definition and history of microbiology
- Microscopy:
 - Light microscopy
 - Electron microscopy
 - Other types of microscopy
- General morphology of microorganisms:
 - Bacteria
 - Fungi
 - Algae
 - Yeast
 - Viruses
 - Bacteriophages

Unit 2: Microbial Growth and Influencing Factors

(9 Hours)

- Microbial biomass
- Growth curve of microorganisms
- Batch culture and continuous culture (definitions)
- Factors affecting microbial growth:
 - **Intrinsic factors:**
 - Nutrient content
 - pH
 - Redox potential
 - Antimicrobial barriers
 - Water activity
 - **Extrinsic factors:**
 - Temperature
 - Relative humidity
 - Gaseous atmosphere

Unit 3: Microbiology of Plant-Based Foods

(9 Hours)

- Contamination, spoilage, and preservation of:
 - Fruits and vegetables
 - Cereals and cereal products
 - Pulses
 - Nuts and oil seeds
 - Sugar and sugar products

Unit 4: Microbiology of Animal-Based Foods

(9 Hours)

- Contamination, spoilage, and preservation of:
 - Milk and milk products
 - Meat and meat products
 - Eggs and poultry
 - Canned foods

Unit 5: Food Safety, Standards, and Microbial Applications

(9 Hours)

- Significance of microbes in:
 - Food quality
 - Food safety
 - Food standards
- HACCP (Hazard Analysis Critical Control Point) in nutrition and dietetics
- Beneficial and harmful effects of microorganisms

- Fermented foods:
 - Curd
 - Cheese
 - Sauerkraut
 - Fermented meat
 - Soy-based foods
 - Alcoholic beverages
 - Vinegar

PRACTICAL

(30 Hours)

1. Basic lab techniques for food microbiology
2. Bright field light microscopy
3. Hanging Drop Method–Motility of Bacteria
4. Staining of Bacteria–Simple Staining, Gram Staining
5. Sterilization techniques
6. Preparation of common laboratory media, broth and slant
7. Serial dilution and plating techniques– pour plate, streak plate
8. Enumeration of cell counts– colony forming units.
9. Most probable number test
10. Microbial analysis of water
11. Microbial analysis of liquid foods –Milk and Fruit juice
12. Microbial analysis of solid foods

Text Books

- Food Microbiology Frazier, C. (2024). *Food Microbiology* (6th Revised ed.). Science Technology.
- Food Microbiology Narang, S. P. (2014). *Food Microbiology*. APH Publishing Corporation, New Delhi. ISBN: 9788176487405.
- Food Microbiology Foster, W. M. (2016). *Food Microbiology*. CBS Publishers & Distributors Pvt. Ltd., New Delhi. ISBN: 9788123929125.

Reference Books

- Food Microbiology Adams, M. R., & Moss, M. O. (2015). *Food Microbiology*. New Age International (P) Ltd., New Delhi. ISBN: 9788122439756.
- Microbiology: A Laboratory Manual Cappuccino, J. G., & Sherman, N. (2008). *Microbiology: A Laboratory Manual* (8th ed.). Pearson Education. ISBN: 9780321648785.
- Modern Food Microbiology Jay, J. M. (2015). *Modern Food Microbiology* (4th ed.). CBS Publishers & Distributors. ISBN: 9788123912044.

Webliography

- Frontiers in Microbiology – Food Microbiology Section

- [Food Microbiology Academy](#)
- [Science.gov – Fundamental Food Microbiology Resources](#)

BND 202 FUNDAMENTALS OF BIOCHEMISTRY

L-3/T/P-1/C-4

Course Outcomes

- Understand the structure and functions of biomolecules.
- Explain biochemical reactions and metabolic pathways.
- Relate biochemical principles to nutrition and health sciences.

Program Outcomes

- Build a strong foundation in biochemical concepts relevant to nutrition.
- Apply biochemical knowledge in clinical and laboratory settings.
- Develop analytical thinking in biological sciences.

Learning Objectives

- Study the chemistry of carbohydrates, proteins, lipids and nucleic acids.
- Understand enzyme action and metabolic regulation.
- Explain the biochemical basis of human health and disease.

Learning Outcomes

- Classify biomolecules and describe their functions.
- Explain enzyme kinetics and metabolic reactions.
- Relate biochemical processes to nutritional applications.

SYLLABUS

Unit I: Carbohydrates – Structure and Classification

9 Hours

- Introduction and classification of carbohydrates.
- Structure and properties of monosaccharides: hexoses and pentoses.
- Stereoisomerism and optical activity of monosaccharides.
- Reactions of monosaccharides: oxidation and reduction.
- Reactions with hydrogen cyanide, hydroxylamine and phenylhydrazine.

Unit II: Oligosaccharides and Polysaccharides

9 Hours

- Structure and properties of oligosaccharides.
- Chemistry and biological importance of sucrose, maltose and lactose.
- Structure and significance of isomaltose and cellobiose.

- Homopolysaccharides: structure and functions.
- Biological importance of carbohydrates.

Unit III: Lipids

9 Hours

- Introduction and classification of lipids.
- Triglycerides (fats): structure and properties.
- Phospholipids and non-phosphorylated lipids: cerebrosides, gangliosides and sulfolipids.
- Characterization and rancidity of fats.
- Chemistry and nutritional importance of essential fatty acids.

Unit IV: Amino Acids, Peptides and Proteins

9 Hours

- Structure and classification of standard amino acids.
- Rare amino acids and non-protein amino acids.
- Physical and electrochemical properties of amino acids.
- Reactions of amino acids due to amino, carboxyl and R groups.
- Peptides: peptide bond, structure and biological importance of glutathione and valinomycin.

Unit V: Nucleic Acids and Enzymes

9 Hours

- Composition, structure and functions of nucleic acids.
- Structure and properties of DNA and RNA (t-RNA, m-RNA and r-RNA).
- Minor RNA types and their functions.
- Classification of enzymes and IUB classification.
- Enzyme kinetics: Michaelis–Menten equation and factors affecting enzyme activity (pH, temperature, substrate concentration and enzyme concentration).

Practical

1. Good Laboratory Practices Safety measures in Laboratory, Preparation of Molar and Normal solutions, Safety Hazards and Disposal of wastes, Calibration of volumetric glassware- burette, pipette, and measuring cylinder
5 Hours
2. Reactions of Monosaccharides, Disaccharides and Polysaccharides : Pentose, Glucose, Fructose, Galactose and Mannose, Sucrose, Maltose, Lactose, Starch, Dextrin and glycogen
5 Hours
3. Qualitative analysis of Proteins; Precipitation reactions of proteins, color reactions of proteins, color reactions of amino acids, Color reactions of proteins- Biuret, Xanthoproteic, Millon's
10 Hours
4. Qualitative analysis of Lipids : Solubility, Acrolein test, Salkowski test, Lieberman- Burchard test. Demonstration- Characterization of fats- acid number, iodine number, saponification number, and RM number.

Text Books

- Biochemistry Satyanarayana, U., & Chakrapani, U. (2021). *Biochemistry* (6th ed., Revised Reprint). Elsevier. ISBN: 9788131264355.
- Lehninger Principles of Biochemistry Nelson, D. L., & Cox, M. M. (2021). *Lehninger Principles of Biochemistry*. W. H. Freeman and Company, New York. ISBN: 9781319381493.
- Food Biochemistry Dickson, J. K. (2020). *Food Biochemistry*. CBS Publishers & Distributors. ISBN: 9789389396355.
- Biochemistry: Concepts and Connections Appling, D. R., Cahill, S. J. A., & Mathews, C. K. (2018). *Biochemistry: Concepts and Connections* (2nd ed.). Pearson Education Limited. ISBN: 9780134641621.

Reference Books

- Harper's Illustrated Biochemistry Kennelly, P., Botham, K., McGuinness, O., Rodwell, V., & Weil, P. A. (2022). *Harper's Illustrated Biochemistry* (32nd ed.). McGraw Hill. ISBN: 9781260469943.

Webliography

- [Biochemical Society](#)
- [AOAC India – E-learning](#)

BND 203 NUTRITION THROUGH LIFE CYCLE**L-2/T/P-2/C-4****Course Outcomes**

- Understand nutritional needs during different life stages.
- Explain dietary management across the life cycle.
- Identify nutrition-related problems in each stage.

Program Outcomes

- Plan age-specific balanced diets.
- Promote nutritional well-being throughout life.
- Support maternal and child nutrition programs.

Learning Objectives

- To study nutrition from infancy to old age.
- To understand physiological changes during growth.

- To learn dietary recommendations for all age groups.

Learning Outcomes

- Describe nutritional requirements in each life stage.
- Plan diets for children, adults, and elderly.
- Identify common nutritional deficiencies.

SYLLABUS

Unit 1: Basic Concepts of Meal Planning

(6 Hours)

- Concepts of:
 - EAR (Estimated Average Requirement)
 - RDA (Recommended Dietary Allowance)
 - Dietary Reference Intakes (DRIs)
- Dietary Guidelines for Indians
- Meal planning:
 - Objectives
 - Principles
- Factors affecting meal planning:
 - Nutritional
 - Socio-cultural
 - Religious
 - Geographic
 - Economic
 - Availability of time, energy, and resources
- Indian meal patterns:
 - Vegetarian
 - Non-vegetarian
- Food faddism and unhealthy food habits

Unit 2: Nutrition During Adulthood & for Athletes

(6 Hours)

- Reference man and woman:
 - Nutritional requirements
 - Recommendations
- Nutrition-related problems and concerns in adults
- Meal planning for:
 - Healthy lifestyle
 - Prevention of chronic diseases
- General diets for athletes:
 - Energy and nutrient needs
 - Balanced diet for performance

Unit 3: Nutrition in Pregnancy and Lactation

(6 Hours)

- Physiological stages of pregnancy
- Physiology of lactation
- Nutritional requirements and recommendations
- Nutrition-related problems and concerns
- Meal planning:
 - Maternal health
 - Child health

Unit 4: Nutrition for Infancy

(6 Hours)

- Importance of breastfeeding
- Exclusive breastfeeding
- Early initiation and colostrum
- Nutritional requirements and recommendations
- Nutrition-related problems and concerns
- Complementary feeding:
 - Timely introduction
 - Adequacy
 - Consistency
 - Frequency
 - Utilization
 - Safety
- Meal planning focusing on infant health

Unit 5: Nutrition During Growth & Old Age

(6 Hours)

- **Growing years:**
 - Preschool children
 - School children
 - Adolescents
 - Nutritional requirements
 - Guidelines and healthy food choices
 - Role of physical activity
- **Geriatric nutrition:**
 - Physiological changes in old age
 - Nutritional requirements
 - Nutritional concerns
 - Healthy food choices
- Meal planning:
 - Growth and development
 - Maintenance of good health in elderly

PRACTICAL

(60 Hours)

1. Introduction to meal planning, Use of food exchange list, Recipe standardization
2. Meal Planning (as per nutritional requirements) and preparation of healthy diets and dishes for adult man and woman
3. Meal Planning (as per nutritional requirements) and preparation of healthy diets and dishes for pregnant woman
4. 4. Meal Planning (as per nutritional requirements) and preparation of healthy diets and dishes for lactating woman
5. Meal Planning (as per nutritional requirements) and preparation of healthy diet and dishes for infants. Planning homemade premixes.
6. Meal Planning (as per nutritional requirements) and preparation of healthy diet and lunch box dishes for Preschool child
7. Meal Planning (as per nutritional requirements) and preparation of healthy diet and lunch box for School-age child
8. Meal Planning (as per nutritional requirements) and preparation of healthy diet and lunch box for adolescents.
9. Planning healthy snacks and beverages for all age groups

Reference Books

- Textbook of Nutrition and Dietetics Khanna, K., Gupta, S., Seth, R., Passi, S. J., Mahna, R., & Puri, S. (2013). *Textbook of Nutrition and Dietetics*. Phoenix Publishing House Pvt. Ltd. ISBN: 8188901539.
- Perspectives in Nutrition Wardlaw, G. M., Hampl, J. S., & DiSilvestro, R. A. (2004). *Perspectives in Nutrition* (6th ed.). McGraw Hill. ISBN: 0072921633, 9780072921632.
- Nutrition: A Lifecycle Approach Chadha, R., & Mathur, P. (Eds.). (2015). *Nutrition: A Lifecycle Approach*. Orient Blackswan, New Delhi. ISBN: 9788125059301.
- Textbook of Human Nutrition Bamji, M. S., Krishnaswamy, K., & Brahman, G. N. V. (2009). *Textbook of Human Nutrition* (3rd ed.). Oxford & IBH Publishing Co. Pvt. Ltd. ISBN: 9788120417427.
- Dietetics Srilakshmi, B. (2023). *Dietetics* (9th ed.). New Age Publishers. ISBN: 9395161841.
- Diet Planning through the Life Cycle: Part 1 – Normal Nutrition Seth, V., & Singh, K. (2006). *Diet Planning through the Life Cycle: Part 1 – Normal Nutrition: A Practical Manual*. Elite Publishing House Pvt. Ltd., New Delhi. ISBN: 8193599624.
- Indian Food Composition Tables National Institute of Nutrition (NIN). (2023). *Indian Food Composition Tables*. Hyderabad. ISBN: 9352676777.
- Dietary Guidelines for Indians ICMR–National Institute of Nutrition. (2024). *Dietary Guidelines for Indians: A Manual* (Revised ed.). Hyderabad.

BND 204 PSYCHOLOGY AND SOCIOLOGY APPLIED TO HEALTH CARE

L-4/T/P/C-4

Course Outcomes

- Understand psychological and sociological concepts related to health care.
- Analyze human behavior and social factors affecting health.
- Apply communication and counseling skills in health care practice.

Program Outcomes

- Develop interpersonal and professional skills in patient care.
- Promote holistic health care through psychosocial understanding.
- Improve teamwork and ethical practices in health settings.

Learning Objectives

- Study basic concepts of psychology and sociology.
- Understand behavior, personality and social interactions.
- Learn the influence of culture and society on health.

Learning Outcomes

- Explain psychological factors affecting health and illness.
- Identify social determinants influencing health care.
- Demonstrate effective communication in patient interactions.

Unit I: Introduction to Psychology and Sociology in Health Care

12 Hours

- Introduction to psychology and sociology.
- Foundational psychological theories and findings in psychology.
- Relationship between psychology and sociology.
- Concept of health and concept of illness.
- Sociological view of illness and health care.

Unit II: Psycho-Social Interventions and Interdisciplinary Health Care

12 Hours

- Psycho-social intervention approaches in health care.
- Psychotherapeutic approaches for acute and chronic physical illness.
- Counseling and support systems for patients and families.
- Role of interdisciplinary approaches in health care.
- Importance of psycho-social care in patient management.

Unit III: Social Determinants of Health

12 Hours

- Cultural, systemic and environmental factors affecting human development.
- Social determinants influencing health and disease.
- Psychological factors influencing health behaviors.
- Health care utilization and patient attitudes.
- Impact of society and environment on health outcomes.

Unit IV: Chronic Illness and Management

12 Hours

- Psychological impact of chronic illness on patients and families.
- Emotional and behavioral responses to chronic diseases.
- Sociological perspectives on chronic illness management.
- Long-term care and rehabilitation approaches.
- Case studies on patient support systems and chronic care management.

Unit V: Application of Psycho-Social Science Theories

12 Hours

- Psychoanalytic theories and their applications in health care.
- Developmental and interpersonal theories.
- Humanistic and behavioral theories.
- Behavioral aspects of health and medical care.
- Policies and strategies to improve health care systems.

Text Books

- Psychology at Work Warr, P. B. (2002). *Psychology at Work*. Penguin Books Ltd. ISBN: 9780141000107.
- The Happiness Equation Pasricha, N. (2016). *The Happiness Equation: Want Nothing + Do Anything = Have Everything*. G. P. Putnam's Sons. ISBN: 9780425277980.

Reference Books

- Happiness at Work Pryce-Jones, J. (2010). *Happiness at Work: Maximizing Your Psychological Capital for Success*. John Wiley & Sons. ISBN: 9780470749463.
- Stumbling on Happiness Gilbert, D. (2006). *Stumbling on Happiness*. Alfred A. Knopf. ISBN: 9780739474556.
- Industrial/Organizational Psychology: Understanding the Workplace Levy, P. (2016). *Industrial/Organizational Psychology: Understanding the Workplace* (5th ed.). Worth Publishers. ISBN: 9781319014261.
- The Happiness Project Rubin, G. (2009). *The Happiness Project: Or, Why I Spent a Year Trying to Sing in the Morning, Clean My Closets, Fight Right, Read Aristotle, and Generally Have More Fun*. HarperCollins. ISBN: 9780061583254.

- Habits of a Happy Brain Breuning, L. G. (2016). *Habits of a Happy Brain: Retrain Your Brain to Boost Serotonin, Dopamine, Oxytocin, and Endorphin Levels*. Adams Media. ISBN: 9781440590504.

BND 205 TECHNIQUES OF NUTRITIONAL ASSESSMENT

**L/T/P-4/C
(60 Hours)**

Course Outcomes

- Understand methods of nutritional assessment.
- Explain anthropometric and dietary assessment techniques.
- Interpret nutritional assessment data.

Program Outcomes

- Assess nutritional status of individuals and groups.
- Identify malnutrition and related conditions.
- Support nutrition intervention planning.

Learning Objectives

- To study different nutritional assessment methods.
- To understand dietary survey techniques.
- To learn interpretation of assessment data.

Learning Outcomes

- Measure anthropometric parameters accurately.
- Conduct dietary assessments effectively.
- Analyze nutritional status using assessment tools.

Syllabus

1. Assessment to be done in at least 5 individuals
 - Dietary Assessment - Methods of assessing food intake
 - Using Food and Nutrient Databases
 - Accuracy, Precision and Validity of Dietary Assessment
2. Assessing the Intakes of Individuals using
 - Recommended Dietary Allowances
3. Assessment to be done in at least 5 individuals
 - Anthropometric Assessment – Anthropometric assessment of children
 - Anthropometric assessment of adults
 - Anthropometric assessment of Elderly
 - Body composition measurements
4. Assessment to be done in at least 5 individuals

- Clinical assessment - Screening in Clinical
- Assessment - (MUST Tool, SGA)
- Medical History and Physical Examination
- 5. Assessment of Energy Expenditure and Energy Requirements
- 6. Biochemical Assessment - Assessment of Protein Status
- 7. Biochemical Assessment for Anaemia
- 8. Target group selection from local hospitals suffering from nutritional deficiencies, tabulation, interpretation and report writing of their tested biomarkers.

Reference Books

- Textbook of Community Nutrition Sehgal, S., & Raghuvanshi, R. S. (2007). *Textbook of Community Nutrition*. Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi.
- Human Nutrition in the Developing World Latham, M. C. (1997). *Human Nutrition in the Developing World*. Food and Agriculture Organization of the United Nations.
- A Manual on Community Nutrition Dahiya, S., Boora, P., & Rani, V. (2013). *A Manual on Community Nutrition*. Department of Foods and Nutrition, published under ICAR Assistance Scheme.
- Textbook of Human Nutrition Bamji, M. S., Krishnaswamy, K., & Brahman, G. N. V. (2009). *Textbook of Human Nutrition* (3rd ed.). Oxford & IBH Publishing Co. Pvt. Ltd. ISBN: 9788120417427.
- Nutritional Status Assessment Fidanza, F. (1991). *Nutritional Status Assessment*. Springer Science Business Media.
- A Guide to Nutritional Status Assessment Beghin, I., Cap, P., & Dujardin, B. (1988). *A Guide to Nutritional Status Assessment*. World Health Organization, Geneva.

BND 206 SOFT SKILLS AND COMMUNICATION

L-2/T/P/C-2

Course Outcomes

- Develop effective verbal and written communication skills.
- Enhance interpersonal and professional skills.
- Improve confidence in presentations and group interactions.

Program Outcomes

- Build professional competence and workplace readiness.
- Strengthen teamwork, leadership and communication abilities.
- Promote ethical and effective professional behavior.

Learning Objectives

- Study principles of communication and soft skills.

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- Learn presentation, listening and interpersonal skills.
- Understand professional etiquette and personality development.

Learning Outcomes

- Communicate effectively in academic and professional settings.
- Demonstrate leadership and teamwork skills.
- Apply soft skills for personal and career development.

SYLLABUS

Unit I: Fundamentals of Communication Skills

6 Hours

- Need and importance of communication in the present context.
- Types of communication: verbal, non-verbal and written communication.
- Principles and barriers of effective communication.
- Workplace communication skills and professional interactions.
- Use of language for effective communication.

Unit II: Workplace Communication and Vocabulary Building

6 Hours

- Oral presentations, group discussions and public speaking.
- Interviews, extempore presentations and professional conversations.
- E-mails, memos, business letters, blogs and report writing.
- Techniques of dyadic communication: message pacing, chunking, mirroring and paraphrasing.
- Vocabulary building: word roots, prefixes, Greek and Latin roots.

Unit III: Soft Skills and Personality Development

6 Hours

- Introduction to soft skills and hard skills.
- Meaning, definition and theories of personality.
- Personality development: self-perception, self-concept and self-esteem.
- Gender stereotyping, aspirations, achievements and fulfillment.
- Determinants of personality: physical, intellectual, emotional, social, educational and family factors.

Unit IV: Professional Etiquettes and Public Speaking

6 Hours

- Cosmopolitan culture and presentational etiquettes.
- Formal dressing, greetings and professional behavior.
- Goal setting, decision making, career planning, resume building and interview skills.

- Types of speeches: persuasive, informative and motivational speeches.
- Structuring and delivering speeches with effective voice modulation, posture, gesture, eye contact and body language.

Unit V: Listening Skills and Presentation Techniques

6 Hours

- Importance of listening in communication.
- Listening styles: active and passive, direct and indirect listening.
- Listening improvement techniques and adjusting listening styles.
- Audio-video conversations, pronunciation exercises and role plays.
- Visuals in presentations: computer-aided presentations and evaluation of communication skills through group discussions and interviews.

Reference Books

- Everything You Need to Know About Public Speaking Lamerton, J. (2001). *Everything You Need to Know About Public Speaking*. HarperCollins, Glasgow.
- Effective Group Communication Ernest, S., & Sharon, A. R. (1985). *Effective Group Communication: How to Get Action by Working in Groups*. National Textbook Company, Lincolnwood.
- The Role of Collective Action Vanni, F. (2014). *The Role of Collective Action*. In *Agriculture and Public Goods* (Vol. 21). Springer Science + Business Media Dordrecht. DOI: 10.1007/978-94-007-7457-5_2.
- The Big Book of Conflict Resolution Games Scannell, M. (2010). *The Big Book of Conflict Resolution Games: Quick, Effective Activities to Improve Communication, Trust, and Collaboration*. ISBN: 9780071743662.
- Facilitating Group Communication in Context Frey, L. R. (2005). *Facilitating Group Communication in Context: Innovations and Applications with Natural Groups*. Hampton Press.

BND 207 ADVANCED COMPUTER LITERACY FOR NUTRITIONISTS **L/T/P-2/C-2**

Course Outcomes

- Understand the basics of computer applications in nutrition.
- Apply digital tools for data management and presentation.
- Use computer software for nutrition analysis and reporting.

Program Outcomes

- Develop digital competency for academic and professional use.
- Improve efficiency in nutrition documentation and analysis.
- Promote technology-based learning and research skills.

Learning Objectives

- Study computer fundamentals and software applications.
- Learn the use of spreadsheets, presentations and internet resources.
- Understand digital tools used in nutrition and dietetics.

Learning Outcomes

- Operate basic computer applications effectively.
- Prepare reports, presentations and nutrition data sheets digitally.
- Utilize technology for nutrition education and communication.

Practical

Unit I: Internet Security, Cyber Law and Artificial Intelligence

6 Hours

- Internet security: concepts, threats and preventive measures.
- Privacy, ethical issues and cyber laws related to digital communication.
- Safe use of internet resources in health and nutrition practice.
- Introduction to Artificial Intelligence (AI) in nutrition and dietetics.
- Applications and benefits of AI for nutritionists and dietitians.

Unit II: Introduction to Web Design and Development

6 Hours

- Introduction to web design and web technologies.
- Types of web pages and characteristics of effective websites.
- Web design pyramid and principles of website building.
- Web development process models.
- Basics of creating nutrition and health-related web content.

Unit III: Computer Applications and Data Analysis

6 Hours

- Use of computers in nutrition and dietetics.
- Fundamentals of computer-based data analysis.
- Spreadsheet applications for nutrition calculations and reporting.
- Preparation and interpretation of digital reports and charts.
- Data management techniques in health and nutrition practice.

Unit IV: Mobile Applications for Diet Counseling and Planning

6 Hours

- Mobile-based applications for diet counseling and diet planning.
- Meal planning and menu planning modules.

- Exercise tracking and nutritional analysis tools.
- Patient record management using digital applications.
- Diet analysis spreadsheets, reports and food diary analysis.

Unit V: Nutrition Databases and Multimedia Nutrition Education

6 Hours

- Recipe analysis and recipe management software.
- Indian and international nutrient databases.
- Meal and menu plan creation and analysis.
- Interactive multimedia tools in nutrition education.
- Role of digital technology in nutrition communication and awareness programs.

Reference Books

- Computer Applications in Nutrition and Dietetics: An Annotated Bibliography
Orta, J. (2018). *Computer Applications in Nutrition & Dietetics: An Annotated Bibliography*. Routledge, New York. eBook ISBN: 9781315057538. DOI: 10.4324/9781315057538.
- Fundamentals of Computers
Thareja, R. (2019). *Fundamentals of Computers* (2nd ed.). Oxford University Press. ISBN: 0199499276.

Webliography

- [ScienceDirect – AI Nutritionist: Intelligent Software as the Next Generation Pioneer of Precision Nutrition](#)
- [ScienceDirect – The Application and Impact of Computer-Generated Personalized Nutrition Education: A Review of the Literature](#)

VAC- STRESS MANAGEMENT

L-1/T/P/C-1

Course Outcomes

- Understand causes and effects of stress.
- Learn stress management techniques.
- Promote mental and emotional well-being.

Program Outcomes

- Apply stress management strategies in daily life.
- Improve personal and professional well-being.
- Support healthy lifestyle practices.

Learning Objectives

- To study sources of stress.
- To understand coping mechanisms.
- To learn relaxation and stress reduction methods.

Learning Outcomes

- Identify symptoms of stress.
- Practice stress management techniques.
- Develop healthy coping skills.

SYLLABUS

Unit I: Introduction to Stress and Stress Responses

3 Hours

- Definition of stress: Eustress and Distress
- Types of stress: Acute stress and Chronic stress
- Biology of stress
 - Fight-or-flight response
 - Stress hormones and physiological responses
- Short-term and long-term effects of stress on physical and mental health
- Role of perception and coping mechanisms in stress management

Unit II: Stressors and Personal Stress Responses

3 Hours

- Internal and external stressors
 - Work-related stress
 - Relationship stress
 - Environmental stressors
- Identifying stress patterns
 - Thoughts
 - Behaviours
 - Physical reactions
- Emotional regulation and its role in stress management
- The stress process and escalation of stress
- Self-awareness and stress assessment techniques

Unit III: Coping Strategies and Stress Management Techniques

3 Hours

- Problem-focused and emotion-focused coping strategies
- Cognitive Behavioral Therapy (CBT) techniques for stress management
- Relaxation techniques

- Deep breathing exercises
- Progressive muscle relaxation
- Time management and organization skills as stress-relief tools
- Developing a personal coping and stress management plan

Unit IV: Lifestyle Approaches for Managing Stress

3 Hours

- Role of physical activity and exercise in stress reduction
- Sleep hygiene and its relationship with stress
- Nutrition and its impact on mental and emotional health
- Social support systems and healthy relationships
- Mindfulness, meditation, and self-care practices
- Importance of work-life balance

Unit V: Stress Management, Resilience, and Long-Term Well-being

3 Hours

- Managing stress at work and educational settings
 - Prioritization and deadline management
 - Handling high-pressure environments
- Building resilience and preventing burnout
- Importance of taking breaks and practicing self-care
- Resilience theory and overcoming adversity
- Developing a growth mindset and emotional intelligence
- Integrating stress management practices into daily life

References:

- Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal, and Coping*. Springer Publishing.
- Selye, H. (1976). *The Stress of Life* (Rev. ed.). McGraw-Hill.
- McEwen, B. S. (2007). *Physiology and Neurobiology of Stress and Adaptation*. Physiology Reviews.
- Baum, A., Revenson, T. A., & Singer, J. E. (2001). *Handbook of Health Psychology*. Psychology Press.
- Taylor, S. E. (2018). *Health Psychology* (10th ed.). McGraw-Hill Education.
- Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). *Stress and Health: Psychological, Behavioral, and Biological Determinants*. Annual Review of Clinical Psychology.
- Kabat-Zinn, J. (2013). *Full Catastrophe Living*. Bantam Books.
- Cooper, C. L., & Dewe, P. J. (2004). *Stress: A Brief History*. Blackwell Publishing.
- Sapolsky, R. M. (2004). *Why Zebras Don't Get Ulcers*. Henry Holt and Company.
- Folkman, S. (2011). *The Oxford Handbook of Stress, Health, and Coping*. Oxford University Press.

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

Third Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 301	Macronutrients in Human Nutrition	4	-	4	30	70	100
BND 302	Advanced Food Science	3	1	4	30	70	100
BND 303	Public Health Nutrition	3	1	4	30	70	100
BND 304	Basics of Medical Nutrition Therapy	2	2	4	30	70	100
BND 305	Advanced Biochemistry	3	-	3	30	70	100
BND 306	Food Processing and Preservation	2	1	3	30	70	100
VAC	Health and Well being	2	-	2	100	-	100
TOTAL		19	5	24	280	420	700

BND 301 Macronutrients In Human Nutrition

L-4/T/P/C-4

Course Outcomes

- Understand the functions of carbohydrates, proteins, and fats.
- Explain digestion and metabolism of macronutrients.
- Apply macronutrient knowledge in diet planning.

Program Outcomes

- Promote balanced nutrition for health maintenance.
- Apply nutritional principles in clinical practice.
- Support prevention of nutrition-related disorders.

Learning Objectives

- To study the classification of macronutrients.
- To understand nutrient metabolism.
- To learn dietary requirements of macronutrients.

Learning Outcomes

- Explain the role of macronutrients in the body.
- Calculate dietary requirements of nutrients.
- Prepare balanced diets using macronutrient principles.

SYLLABUS

Unit 1: Fundamentals of Food Chemistry

(12 Hours)

- Properties of foods
 - Solubility
 - Vapour pressure
 - Boiling point
 - Freezing point
 - Osmotic pressure
 - Viscosity
 - Surface tension
 - Specific gravity
 - Oxidation and reduction
- Acids, bases, and buffers
- Chemical bonding
 - Octet rule
 - Ionic bond
 - Covalent bond
 - Hydrogen bond
 - Polar and non-polar molecules
- Colloidal systems in foods
 - Colloids
 - Sols
 - Gels
 - Emulsions
 - Foams
- Water in foods
 - Free water
 - Adsorbed water
 - Bound water
 - Water activity in foods
 - Molecular mobility and food stability

Unit 2: Food Emulsions and Chemistry of Food Components

(12 Hours)

- Food emulsions
 - Oil in water (O/W) emulsions
 - Water in oil (W/O) emulsions
- Stability of emulsions
- Role of emulsifiers and stabilizers
 - Natural emulsifiers
 - Synthetic emulsifiers

- Composition and classification of food components
 - Carbohydrates
 - Proteins
 - Lipids
- Structure and properties of carbohydrates, proteins, and lipids

Unit 3: Chemistry and Processing of Carbohydrates and Proteins

(12 Hours)

- Carbohydrates in foods
 - Changes during cooking
 - Digestibility of carbohydrates
 - Modified starches
 - Enzymatic and chemical hydrolysis
 - Dietary fibre
- Proteins in foods
 - Plant proteins
 - Milk proteins
 - Egg proteins
 - Meat proteins
- Processing-induced changes in proteins
 - Physical changes
 - Chemical changes
 - Nutritional changes
- Formation of toxins and allergens in protein foods
- Functional properties of proteins
- Chemical modification of proteins
 - Acylation
 - Alkylation
 - Phosphorylation
 - Sulphitolysis
 - Esterification

Unit 4: Lipid Chemistry and Fat Processing

(12 Hours)

- Lipids in foods and their functions in processing
- Fat polymorphism
 - Crystallization
 - Consistency of fats
 - Palm kernel fat
 - Cocoa butter
 - Milk butter
- Lipid hydrolysis, auto-oxidation, and thermal decomposition
- Methods of fat extraction
 - Wet rendering

- Dry rendering
 - Pressing techniques
 - Solvent extraction
- Chemistry of fat processing
 - Hydrogenation
 - Deodorization
 - Neutralization
 - Interesterification
- Medium-chain triglycerides (MCTs) and their significance
- Enzymatic and chemical modification of fats
- Fat replacers
 - Natural fat replacers
 - Synthetic fat replacers
- Chemistry of frying and oil absorption
- Effect of hydrocolloids on oil uptake
- Deterioration of fats
 - Hydrolytic rancidity
 - Oxidative rancidity
 - Lipid oxidation products
 - Detection tests for rancidity
- Antioxidants in foods
 - Natural antioxidants
 - Synthetic antioxidants
 - Mechanism of antioxidant action
 - Synergistic role of chelators and antioxidants

Unit 5: Effect of Processing on Foods and Nutrient Fortification

(12 Hours)

- Effect of processing on fruits and vegetables
 - Structural changes
 - Composition changes
- Processing effects on cereals, pulses, and oilseeds
- Processing effects on milk, eggs, meat, and poultry
- Chemical changes and nutrient losses during processing
 - Pasteurization
 - Caramelization
 - Baking
 - Demineralization
 - Dehydration
 - Irradiation
 - Fermentation
 - Freezing
 - Canning
- Fortification, enrichment, and restoration of nutrients

- Micronutrient fortification
 - Fortificants
 - Vehicles of fortification
 - Methods of fortification

Reference Books

1. Manay, N.S. and Shadaksharswamy, M. (2001). Food facts and principles, II Ed. . New Age International (P)Ltd. Publishers, New Delhi.
2. Aurand, L.W. and Woods A.E. (1973). Food chemistry. The AVI Publishing Company, Inc., Westport Connecticut.
3. Mondy, N.I. (1980). Experimental food chemistry. AVI Publishing Company, Inc. Westport Connecticut.
4. Owen r, Fennema, 1996. Food Chemistry, 3rd Edition, Marcel Dekker, Inc., New York, USA
5. H.D. Belitz, 2009. Food Chemistry, 4th Edition. Springer

BND 302 ADVANCED FOOD SCIENCE

L-3/T/P-1/C-4

Course Outcomes

- Understand advanced concepts of food science.
- Explain food quality and preservation methods.
- Analyze the effect of processing on nutrients.

Program Outcomes

- Apply food science knowledge in nutrition practice.
- Promote food safety and hygiene.
- Support healthy food preparation methods.

Learning Objectives

- To study food composition and food chemistry.
- To understand food processing techniques.
- To learn food quality control methods.

Learning Outcomes

- Describe methods of food preservation.
- Explain factors affecting food quality.
- Apply food safety practices effectively.

SYLLABUS

UNIT I

(9 Hours)

Sugar – Processing of sugar from sugarcane; Types and grades of sugar and their uses; Stages of sugar cookery & crystallization; Preparation of caramel sauce, Processing of sugar confectionery – Types of sugar confectionery products – fudge , fondant, lollipop, hard-boiled candy, marshmallow, sugar pastes, and nougat, Chocolate confectionery: Processing of cacao beans to nibs; Processing of chocolate; Types of chocolate – Dark, White, Milk chocolate and compound chocolate; Chocolate defects

UNIT II

(9 Hours)

Beverages: Classification of beverages; Processing of Tea- types of tea; Coffee processing – types of coffee; Decaffeination; Processing cola beverages; Processing of cocoa-based flavored drinks Processing of Fruit based beverages: RTS, Squashes, Crushes Nectars, Cordials, Syrups, Concentrates and fruit juice powders Alcoholic beverages: Fruit Wines – Grape wine, port, perry, cider, sherry, ginger wine and Feni; Alcoholic - Brandy, Beer, Whisky

UNIT III

(9 Hours)

Processing of Bakery Products Breads –Role of ingredients, Processing of Bread, methods of bread mixing, Bread faults and remedies Biscuits – Ingredients, types of biscuits and preparation, defects in biscuit making Processing of cookies - Ingredients, types of Cookies and preparation, defects in Cookie making Processing of Cakes and Muffins: Ingredients and their role, Types of cakes, and types of cake mixing techniques Processing of other bakery products like pizza bases, Doughnuts, Pretzels, Bagels, French Loaf

UNIT IV

(9 Hours)

Novel processing Techniques Supercritical fluid extraction and its applications Irradiation of food – theory, application, advantages and disadvantages High pressure processing of foods - theory, application, advantages and disadvantages Ohmic heating and Pulsed electric field processing - theory, application, advantages and disadvantages Pulsed light and Infrared heating - theory, application, advantages and disadvantages

UNIT V

(9 Hours)

Processing of Convenience – RTC and RTE foods; Weaning mixes and infant foods Processing pasta, and noodles Extrusion – types of extrusion, types of extruders, Classification of extruded products Processing of snack foods – fried snacks, popped and flaked snacks

PRACTICALS

(30 Hours)

1. Stages of sugar crystallization
2. Preparation of Fudge and fondant
3. Preparation of hardboiled candy and caramel
4. Preparation of chocolate and enrobed products with chocolate
5. Preparation of hot beverages- coffee, tea and malt beverages
6. Preparation of cold Beverages- fruit drinks & milk shakes
7. Processing of Bread
8. Processing of Biscuits and cookies
9. Processing of Pizza and dough nuts

10. Preparation noodles and pasta
11. Preparation of RTE mixes and weaning foods
12. Preparation of popped grains and coating them
13. Preparation of flaked cereal and millet
14. Preparation of extruded snacks.
15. Sensory Evaluation and preparation of scorecard.

Reference Books

- Food Processing Technology Fellows, P. J. *Food Processing Technology*.
- Food Science Potter, N. N. *Food Science*.
- Experimental Study of Foods Griswold, R. M. *Experimental Study of Foods*.
- Food Science Charley, H. *Food Science*.
- Beverages: Processing and Technology Mudgil, D., & Barak, S. *Beverages: Processing and Technology*.
- Bakery Science and Technology Matz, S. A. *Bakery Science and Technology*.
- Food Fundamentals McWilliams, M. *Food Fundamentals*. John Wiley & Sons, New York.
- Extrusion Cooking Guy, R. *Extrusion Cooking*.
- Cocoa, Confectionery, and Chocolate Products Minifie, B. W. *Cocoa, Confectionery, and Chocolate Products*.
- Fruit and Vegetable Preservation Kumar, S., & Srivastava. *Fruit and Vegetable Preservation*.

BND 303 PUBLIC HEALTH NUTRITION

L-3/T/P-1/C-4

Course Outcomes

- Understand the principles and scope of public health nutrition.
- Explain the relationship between nutrition and community health.
- Apply nutrition strategies for disease prevention and health promotion.

Program Outcomes

- Promote community nutritional well-being through health education.
- Apply public health nutrition principles in community settings.
- Support national nutrition and health programs effectively.

Learning Objectives

- To study concepts of public health and nutrition.
- To understand nutritional problems in communities.
- To learn nutrition intervention and health promotion strategies.

Learning Outcomes

- Identify common nutritional problems in communities.
- Plan basic nutrition education and awareness programs.
- Apply public health nutrition knowledge for disease prevention.

SYLLABUS

Unit 1: Introduction to Public Health Nutrition

(9 Hours)

- Introduction to Public Health Nutrition (PHN)
- Definition, scope, and importance of PHN
- Roles and responsibilities of public health nutritionists
- Concepts related to public health nutrition
 - Positive health
 - Malnutrition
 - Undernutrition
 - Overweight and obesity
 - Micronutrient malnutrition
 - Nutritional status
 - Nutrition intervention
 - Food and nutrient supplements
 - Food substitutes
 - Nutrition education
- Importance of nutrition in community health and development

Unit 2: Health Systems, Food Security, and Nutritional Status

(9 Hours)

- Primary Health Care and Health Systems in India
- National Health Care Delivery System
- Determinants and indicators of health status
- Food and Nutrition Security
 - Food production
 - Food access and distribution
 - Food availability and losses
 - Food consumption and dietary patterns
 - Implications on nutrition and health
- Determinants of nutritional status of individuals and populations
 - Sociocultural factors
 - Biological factors
 - Environmental factors
 - Economic factors
- Approaches and strategies for improving nutritional status
 - Health-based interventions

- Food-based interventions
- Nutrition education for behaviour change
- Supplementation
- Food fortification

Unit 3: Nutrition, Population, and Sustainable Development

(9 Hours)

- Nutrition as a developmental priority
- Population dynamics at local, national, and global levels
- Demographic transition and population structure
- Fertility and population behaviour
- Quality of life and burden of disease
- Burden of death and disease at local, national, and global levels
- United Nations (UN) Decade of Action on Nutrition (2016–2025)
- Nutrition and Sustainable Development Goals (SDGs)
- Role of nutrition in achieving global development targets
- Overview of nutrition-related SDGs

Unit 4: Nutrition Across the Life Cycle

(9 Hours)

- Importance of nutrition throughout the life cycle
- Role of nutrition in achieving global health targets
- Optimal Infant and Young Child Feeding (IYCF) practices
- Significance of the first 1000 days of life
- Improving maternal, infant, and young child nutrition
- WHO Global Nutrition Targets
- Role of dietary risk factors in Non-Communicable Diseases (NCDs)
- Nutrition and maternal and child health
- Prevention and control of micronutrient deficiencies

Unit 5: Nutritional Surveillance and Monitoring Systems

(9 Hours)

- Nutritional surveillance and surveillance systems
- Purpose and importance of nutritional surveillance in programme planning and evaluation
- Nutritional surveillance in ICDS programmes
 - Reporting systems
 - Strengths and weaknesses
 - Government initiatives for improving surveillance systems
- Monthly Programme Reports and their applications
- Long-term nutrition monitoring and evaluation of programme impact
- Timely warning and intervention systems
- Types of nutritional surveillance and indicators
- Data sources in India

- NNMB
- NFHS
- NSSO
- ICDS
- NSS
- Census
- MICS
- CES
- Nutrition surveillance for action – Triple A Cycle
- Critique and interpretation of nutrition surveillance data sources such as NFHS and NNMB

PRACTICAL

UNIT 1

(6 Hours)

- Understand the situational analysis of ongoing National Nutrition Program
 - ICDS
 - MDM
 - Urban Primary Health Center
 - Rural Health Center and Sub Centres

UNIT 2

(6 Hours)

- Understand the significance of a local event calendar and prepare a calendar for the past three years.
 - Understand local and national Surveillance data sets (NFHS, NNMB, DLHS) for various age groups (Pregnant, Lactation, children under 5y, Adult man and Adult women),

UNIT 3

(6 Hours)

- Assess the nutritional status of populations using Indirect parameters
- Prepare a tool to assess the SES of different income groups (LIG, HIG, MIG as per Kuppuswamy scale), (10 subjects/student).
- Morbidity profile (last 15 days) (10 subjects/student), and understand ICD 11.
- Assess the nutritional status of populations using Direct parameters (Primary care setup)
- Understand the use of a growth chart as an advocacy tool.
- Conduct anthropometric measurements and data analysis in a community setup for children and adults (weight, height, BMI, waist/hip, MUAC), (10 subjects/student) and classify them using Asia Pacific and WHO cutoffs of BMI.
- Introduce the WHO Child Growth Standard Analysis and interpretation using WHO Anthro and Anthroplus software.

UNIT 4

(6 Hours)

- Assess the nutritional status of populations using Direct parameters (Primary care setup)
- Dietary Data and its analysis : assess the dietary intakes (10 subjects/student), using 24hDRM and FFQ using standard cups and measures in a community. □

- Analysis, comparisons with RDA, calculation of consumption units and interpretation using the RDA (NIN, 2024), identifying dietary risk factors from dietary intake data.
- Compute dietary diversity score.

UNIT 5

(6 Hours)

- Assess the nutritional status of populations using Direct parameters (Primary care setup)
- Understanding the Clinical signs and symptoms for various nutritional deficiencies through field visits, power point presentations, videos:
 - i. SAM/MAM
 - ii. Anemia
 - iii. VAD, Xerophthalmia
 - iv. IDD
 - v. Water soluble vitamin B-Complex and ascorbic acid
 - vi. Zinc and other micronutrients

Reference Books

- Textbook of Community Medicine Preventive and Social Medicine with Recent Update Lal, S. (2018). *Textbook of Community Medicine: Preventive and Social Medicine with Recent Update*. CBS Publishers & Distributors Private Limited. ISBN: 938774289X, 9789387742895.
- Public Health Nutrition in Developing Countries Vir, S. C. (2011). *Public Health Nutrition in Developing Countries* (2nd ed., Vols. 1–2). Woodhead Publishing India Pvt. Ltd. ISBN: 9789388320351.

Webliography

- [UNICEF](#)
- [World Health Organization \(WHO\)](#)
- [World Food Programme \(WFP\)](#)
- [WHO – United Nations Decade of Action on Nutrition](#)
- [Mother, Infant, and Young Child Nutrition and Malnutrition – India Overview](#)
- [WHO – Double Burden of Malnutrition](#)
- [United Nations Development Programme – Sustainable Development Goals](#)
- [WHO – Global Targets 2025](#)
- [UNICEF – Improving Breastfeeding, Complementary Foods and Feeding Practices](#)
- [National Guidelines on Infant and Young Child Feeding](#)
- [WHO Health Statistics and Information Systems – Global Health Estimates](#)
- [WHO – Noncommunicable Diseases and Risk Factors](#)
- [CDC – Overview of Non-Communicable Diseases and Related Risk Factors](#)

BND 304 BASICS OF MEDICAL NUTRITION THERAPY

L-2/T/P-2/C-4

Course Outcomes

- Understand principles of medical nutrition therapy.
- Explain dietary modifications for diseases.
- Develop therapeutic diet plans for patients.

Program Outcomes

- Apply diet therapy in clinical nutrition practice.
- Support disease management through nutrition care.
- Promote patient health and recovery.

Learning Objectives

- To study principles of therapeutic nutrition.
- To understand nutritional management of diseases.
- To learn practical diet planning techniques.

Learning Outcomes

- Plan therapeutic diets for common diseases.
- Assess patient nutritional requirements.
- Demonstrate basic diet counseling skills.

SYLLABUS

Unit 1: Concepts in Basic Dietetics and Modified Diets

(6 Hours)

- Concepts in basic dietetics and growth of dietetics
- Purpose and principles of therapeutic diets
- Modifications of normal diets
- Cultural aspects in diet planning
- Role and responsibilities of a dietitian
- Modified hospital diets
 - Consistency and texture modifications
 - Clear liquid diet
 - Full liquid diet
 - Soft diet
 - Mechanically soft diet
 - Convalescent diet
 - Regular diet
- Nutrient modifications
 - Sodium modification
 - Fibre modification
 - Residue modification

Unit 2: Nutrition and Weight Management

(6 Hours)

- Concept of energy balance
- Body composition and fitness
- Parameters for assessment of obesity and underweight
- Grades and types of obesity
- Etiology and pathophysiology of obesity
- Medical Nutrition Therapy (MNT) for weight management
 - Diet therapy
 - Exercise therapy
 - Behavioral modification strategies
 - Pharmacological treatments
 - Surgical treatments
- Nutritional management of
 - Underweight
 - Anorexia nervosa
 - Bulimia nervosa
- Fad diets and their implications
- MNT for thyroid disorders
- MNT for Polycystic Ovarian Disease (PCOD)

Unit 3: Nutrition, Immunity, and Infections

(6 Hours)

- Nutritional status and immunity
- Overview of the immune system
- Nutrients important for immunity
- MNT for infectious diseases and fevers
 - Food-borne infections
 - Typhoid
 - Tuberculosis
 - Vector-borne diseases
 - Malaria
 - Dengue
 - Viral fevers
 - H1N1
- Pathophysiology and MNT for HIV/AIDS
- Role of nutrition in infection prevention and recovery

Unit 4: Gastrointestinal Disorders and Medical Nutrition Therapy

(6 Hours)

- Disorders of the upper gastrointestinal tract
 - Gastroesophageal reflux disease (GERD)
 - Esophagitis

- Hiatus hernia
- Disorders of the stomach
 - Gastritis
 - Peptic ulcer
- Disorders of the lower gastrointestinal tract
 - Constipation
 - Diarrhea
 - Celiac disease
 - Tropical sprue
 - Lactose intolerance
 - Inflammatory bowel disease
 - Crohn's disease
 - Ulcerative colitis
 - Irritable bowel syndrome
 - Diverticular disease
- Pathophysiology and Medical Nutrition Therapy for gastrointestinal disorders

Unit 5: Liver, Gallbladder, Pancreatic, and Rheumatic Disorders

(6 Hours)

- Diseases of the liver
 - Hepatitis
 - Cirrhosis
 - Hepatic failure
 - Alcoholic liver disease
 - Liver abscess
 - Nonalcoholic steatohepatitis (NASH/MASLD)
 - Wilson's disease
 - Liver transplant
- Diseases of the gallbladder
 - Cholelithiasis
 - Cholecystitis
 - Cholestasis
- Acute and chronic pancreatitis
- Liver, gallbladder, and pancreas function tests – brief introduction
- Dietary guidelines and elimination diets
- Allergen tests and food challenge tests
- Pathophysiology and MNT for
 - Osteoarthritis
 - Rheumatoid arthritis
 - Gout

PRACTICAL

Unit 1: Modified Hospital Diets

(12 Hours)

- Standardization of recipes for modified hospital diets
 - Clear liquid diets
 - Full liquid diets
 - Soft diets
 - Mechanically soft diets
 - Convalescent diets
 - Regular diets
- Consistency and texture modifications
- Nutrient modifications
 - Sodium
 - Fibre
 - Residue

Unit 2: Diet Planning for Weight Management and Endocrine Disorders

(12 Hours)

- Planning and preparation of diets using My Indian Plate (ICMR-NIN 2024)
- Portion size and portion control concepts
- Diet planning for
 - Overweight
 - Obesity Grade 2
 - Bariatric surgery
 - Bulimia nervosa and anorexia nervosa
 - Underweight
 - Thyroid disorders
 - PCOS

Unit 3: Nutrition, Immunity, and Infection Diet Planning

(12 Hours)

- Planning and preparation of diets for infectious diseases
 - Typhoid
 - Tuberculosis
 - Malaria
 - Dengue
 - H1N1
 - COVID-19
 - HIV/AIDS
- Therapeutic diet modifications for fever and infection management

Unit 4: Diet Planning for Gastrointestinal Disorders

(12 Hours)

- Planning and preparation of diets for
 - Constipation
 - Diarrhea

- Celiac disease
- Tropical sprue
- Lactose intolerance
- Inflammatory bowel disease
- Crohn's disease
- Ulcerative colitis
- Irritable bowel syndrome
- Diverticular disease
- GERD

Unit 5: Diet Planning for Liver, Gallbladder, Pancreatic, and Rheumatic Disorders (12 Hours)

- Planning and preparation of diets for
 - Viral hepatitis (A and C)
 - Cirrhosis
 - Hepatic failure
 - Alcoholic liver disease
 - MASLD/NASH
 - Cholelithiasis
 - Cholecystitis
 - Acute and chronic pancreatitis
- Diagnosis and management of food allergies
- Planning elimination diets and food challenge diets
- Diet planning for
 - Osteoarthritis
 - Rheumatoid arthritis
 - Gout

Reference Books

- Krause and Mahan's Food and the Nutrition Care ProcessKrause, & Mahan. (2022). *Food and the Nutrition Care Process*. Saunders.ISBN: 0323810268.
- Medical Nutrition Therapy PracticeSkipper, A. (2009). *Medical Nutrition Therapy Practice*. Jones & Bartlett Publishers.
- Clinical Nutrition for Surgical PatientsMarian, M., Russell, M. K., & Shikora, S. A. (2008). *Clinical Nutrition for Surgical Patients*. Jones & Bartlett Publishers.
- Manual of Dietetics PracticeThomas, B. (Ed.). (1994). *Manual of Dietetics Practice*. Oxford: Blackwell Scientific Publications.
- Perspectives in NutritionWardlaw, G. M. (1999). *Perspectives in Nutrition* (4th ed.). USA: WCB/McGraw-Hill.
- Application of Clinical NutritionZeman, F. J., & Ney, D. M. (1988). *Application of Clinical Nutrition*. London: Prentice-Hall International.
- Modern Nutrition in Health and DiseaseShils, M. E., Olson, J. A., &Shike, M. (Eds.). (1994). *Modern Nutrition in Health and Disease* (8th ed.). USA: Lea &Febiger.

- Nutrition and Diet Therapy Williams, S. R., & Rodwell. (1993). *Nutrition and Diet Therapy* (7th ed.). USA: Mosby Year Book Inc.
- Nutrition in Health and Disease Anderson, L., & Dibble, M. (1982). *Nutrition in Health and Disease* (17th ed.). Philadelphia: J. B. Lippincott Company.
- Manual of Nutrition Therapeutics Alpers, D., Stenson, W., Williams, R., & Bier, D. (1995). *Manual of Nutrition Therapeutics* (3rd ed.). Boston: Little, Brown and Company.
- Nutrition Guidance After Mini Gastric Bypass Bariatric Surgery Nambiar, V. S., & Zaveri, D. (2024). *Nutrition Guidance After Mini Gastric Bypass Bariatric Surgery*. Adhyayan Publishers and Distributors. ISBN: 8119681169.
- Nutrition Guidelines for Roux-en-Y Gastric Bypass Bariatric Surgery Nambiar, V. S., & Zaveri, D. (2024). *Nutrition Guidelines for Roux-en-Y Gastric Bypass Bariatric Surgery*. Adhyayan Publishers and Distributors. ISBN: 8119681215.

BND 305 ADVANCED BIOCHEMISTRY

L-3/T/P/C-3

Course Outcomes

- Understand biochemical processes in the human body.
- Explain metabolism of nutrients.
- Relate biochemistry with nutrition and health.

Program Outcomes

- Apply biochemical concepts in clinical nutrition.
- Interpret metabolic changes in diseases.
- Enhance analytical and scientific skills.

Learning Objectives

- To study metabolic pathways of nutrients.
- To understand enzyme functions and regulation.
- To learn biochemical aspects of diseases.

Learning Outcomes

- Explain metabolism of carbohydrates, proteins, and fats.
- Identify biochemical changes in disorders.
- Apply biochemical knowledge in nutrition practice.

SYLLABUS

Unit 1: Introduction to Metabolism and Carbohydrate Metabolism

(9 Hours)

- Types of metabolism

- Anabolism
 - Catabolism
- Compartmentalization of metabolic pathways
- Overview and significance of carbohydrate metabolism
- Glycolysis and its energetics
- Entry of other carbohydrates into glycolytic pathway
 - Fructose
 - Galactose
 - Mannose
- Fate of pyruvate
 - Lactate formation
 - Alcohol formation
 - Acetyl-CoA formation

Unit 2: Advanced Carbohydrate Metabolism

(9 Hours)

- Tricarboxylic Acid (TCA) Cycle and its energetics
- Glyoxylate cycle
- Glycogen metabolism
 - Glycogenesis
 - Glycogenolysis
- Cori cycle
- Gluconeogenesis
- Hexose Monophosphate (HMP) shunt and its significance
- Glucuronic acid pathway

Unit 3: Lipid Metabolism

(9 Hours)

- Synthesis of fatty acids
 - Saturated fatty acids
 - Unsaturated fatty acids
 - Essential fatty acids
- Fatty acid β -oxidation
- Ketone body formation and utilization
- Biosynthesis and degradation of
 - Triglycerides
 - Phospholipids
 - Glycolipids
 - Cholesterol
- Regulation and significance of lipid metabolism

Unit 4: Protein and Amino Acid Metabolism

(9 Hours)

- General reactions in amino acid metabolism
 - Transamination
 - Deamination
 - Decarboxylation
- Ketogenic and glucogenic amino acids
- Urea cycle and its significance
- Biosynthesis of proteins
- Regulation and importance of protein metabolism

Unit 5: Nucleic Acid Metabolism

(9 Hours)

- Introduction to nucleic acid metabolism
- Anabolism and catabolism of nucleic acid bases
- Fate of purine bases after catabolism
- Pyrimidine metabolism overview
- Mechanism and types of ribonucleotide reductase enzymes
- Importance of nucleic acid metabolism in cellular functions

Text Books

- Biochemistry Satyanarayana, U., & Chakrapani, U. (2013). *Biochemistry* (4th ed.). Elsevier. ISBN: 9788131236017.
- Biochemistry: Concepts and Connections Appling, D. R., Cahill, S. J. A., & Mathews, C. K. (2019). *Biochemistry: Concepts and Connections* (2nd ed.). Pearson Education Limited.
- Food Biochemistry Dickson, J. K. (2020). *Food Biochemistry*. CBS Publishers & Distributors Pvt. Ltd. ISBN: 9789389396355.

Reference Books

- Food Microbiology Adams, M. R., & Moss, M. O. (2006 Reprint). *Food Microbiology*. New Age International. ISBN: 8122410146.
- Microbiology: A Laboratory Manual Cappuccino, J. G., & Sherman, N. A. (2013). *Microbiology: A Laboratory Manual*. Pearson Benjamin Cummings. ISBN: 9780321840226.
- Modern Food Microbiology Jay, M. J. (2005). *Modern Food Microbiology* (4th ed.). CBS Publishers & Distributors. ISBN: 9788123904757.

Webliography

- Gavin Publishers – Advances in Biochemistry and Biotechnology
- Biochemistry Web by G. Fenteany
- AOAC India – E-learning

BND 306 FOOD PROCESSING AND PRESERVATION

L-2/T/P-1/C-3

Course Outcomes

- Understand food processing and preservation techniques.
- Explain the effect of processing on nutrients.
- Apply preservation methods for food safety.

Program Outcomes

- Promote hygienic food preservation practices.
- Reduce food spoilage and wastage.
- Apply food technology concepts in nutrition practice.

Learning Objectives

- To study food processing methods.
- To understand food preservation techniques.
- To learn storage and packaging methods.

Learning Outcomes

- Describe different preservation methods.
- Explain nutrient losses during processing.
- Demonstrate safe food storage practices.

Syllabus

Unit 1: Introduction to Food Processing and Food Additives

(6 Hours)

- Elements and basic principles of food processing
- Importance and objectives of food processing
- Food additives
 - Definition and need
 - Types of food additives
 - Antioxidants
 - Chelating agents
 - Colouring agents
 - Curing agents
 - Emulsifying agents
 - Flavour enhancers
- Role of food additives in food preservation and quality improvement

Unit 2: Traditional and Modern Food Processing Techniques

(6 Hours)

- Traditional food processing techniques
 - Drying
 - Smoking
 - Freezing
 - Explosive puffing
 - Vacuum packaging
 - Addition of salt and sugar
 - Pickling
- Modern food processing techniques
 - Microwave processing
 - Irradiation
 - Evaporation
 - Ohmic heating
 - Hydrostatic pressure treatment
 - High-voltage pulse electric field technique
- Advantages and applications of modern food processing methods

Unit 3: Types of Processed Foods and Product Development

(6 Hours)

- Types of processed foods
 - Fresh and processed foods
 - Ready-to-eat foods
 - Ready-to-cook foods
 - Extruded foods
 - Fabricated foods
 - Value-added foods
 - Designer foods
 - Health and nutraceutical supplements
 - Functional foods for sports, space, and therapeutic purposes
- Process of product development and standardization
- Product testing methods
 - Sensory evaluation
 - Objective evaluation
 - Shelf life evaluation

Unit 4: Food Preservation Techniques

(6 Hours)

- Introduction to food preservation
- Importance and principles of food preservation
- Types of food spoilage
- Vegan foods and organic foods
- Preservation using low and high temperatures
 - Refrigeration
 - Freezing

- Freeze drying
 - Freeze concentration
- Difference between refrigeration and freezing
- Steps involved in freezing common foods
- Canning, pasteurization, and sterilization
- Storage methods and practical applications

Unit 5: Preservation by Chemicals, Salts, and Fermentation

(6 Hours)

- Preservation using chemicals and salts
- Fermentation
 - Definition and types
 - Advantages of fermentation
 - Common fermented foods
 - Wine and cheese making
- Tomato processing
 - Sauce and ketchup preparation
- Pickling
 - Principles involved
 - Types of pickles
 - Indian pickles
 - Vinegar and salt preservation
- Chemical preservatives
 - Definition and types
 - Role in preservation
 - Permitted preservatives and FPO specifications

PRACTICAL

(30 Hours)

1. Stages in sugar cookery, Evaluation of pectin quality, sugar concentration (Brix), pH and acid content
2. Preparation of jam, jelly, marmalades, preserves, candied, Tutti fruity, Glazed, Crystallized fruits, Toffees
3. Preparation of squashes, fruit juice, and Ready to Serve (RTS)
4. Preparation of Tomato sauce, Tomato ketchup, Preparation of pickles

Text Books

- Food Processing and Preservation Warris, D. S. (2020). *Food Processing and Preservation*. CBS Publishers & Distributors. ISBN: 9789389688597.
- Food Processing and Preservation Subbulakshmi, G., Udipi, S. A., & Ghurge, S. P. (2021). *Food Processing and Preservation* (2nd ed.). New Age International Private Limited. ISBN: 9788122472332.
- Analytical Techniques in Food Processing Sharma, M. (2015). *Analytical Techniques in Food Processing*. Random Publications. ISBN: 9789351116073.

Reference Books

- Food Processing, Packaging, Preservation, Irradiation, Allergy and Safety Joshi, R. D., &Adapure, N. (2017). *Food Processing, Packaging, Preservation, Irradiation, Allergy and Safety*. Agrotech Press.ISBN: 9789384568689.
- Handbook of Food Processing DesignPander, S. N. (2015). *Handbook of Food Processing Design*. Raj Publication.ISBN: 9789382983460.
- Food Storage and PreservationRuth, S. K. (2017). *Food Storage and Preservation*. Navyug Books International.ISBN: 9789380731865.

Webliography

- [Ministry of Food Processing Industries – Government of India](#)
- [National Center for Home Food Processing and Preservation – USDA](#)
- [Institute of Food Technologists – Food Processing](#)

VAC- HEALTHANDWELL-BEING

L-2/T/P/C-2

Course Outcomes

- Understand the concepts of health and wellness.
- Explain factors affecting physical and mental well-being.
- Promote healthy lifestyle practices for overall wellness.

Program Outcomes

- Encourage healthy habits and disease prevention practices.
- Promote physical, mental, and social well-being.
- Support community health awareness programs.

Learning Objectives

- To study dimensions of health and wellness.
- To understand lifestyle factors affecting health.
- To learn strategies for maintaining overall well-being.

Learning Outcomes

- Identify factors influencing health and wellness.
- Practice healthy lifestyle and stress management techniques.
- Promote awareness about health and well-being in communities.

SYLLABUS

Unit I: Introduction to Health, Well-being, and Physical Fitness

6 Hours

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- Overview of health and well-being concepts
- Dimensions of health
 - Physical health
 - Mental health
 - Social health
 - Emotional health
- Impact of lifestyle choices on health
- Importance of physical activity for overall health
- Types of exercise
 - Aerobic exercise
 - Strength training
 - Flexibility exercises
 - Balance exercises
- Developing a personal fitness plan

Unit II: Nutrition, Healthy Eating, and Lifestyle Practices

6 Hours

- Basics of nutrition
 - Macronutrients
 - Micronutrients
- Healthy eating habits and food groups
- Impact of nutrition on physical and mental health
- Building healthy lifestyle habits
- Psychology of habit formation
- Strategies for adopting and maintaining healthy behaviours
- Overcoming barriers to healthy lifestyle changes

Unit III: Mental Health, Emotional Well-being, and Stress Management

6 Hours

- Understanding mental health
 - Definitions
 - Stigma and myths
- Emotional well-being and emotional resilience
- Understanding stress and its effects on health
- Stress management techniques
 - Mindfulness practices
 - Relaxation techniques
 - Time management strategies
- Self-care and coping mechanisms

Unit IV: Sleep, Social Health, and Substance Use

6 Hours

- Importance of sleep for physical and mental health

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- Sleep hygiene and healthy sleep practices
- Effects of sleep deprivation on well-being
- Role of social relationships in health and well-being
- Healthy relationships
 - Communication
 - Boundaries
 - Social support
- Community involvement and social well-being
- Substance use and addiction
 - Alcohol, tobacco, and drug use
 - Understanding addiction and treatment options
 - Preventive and harm reduction strategies

Unit V: Chronic Diseases and Health Promotion

6 Hours

- Overview of common chronic diseases
 - Diabetes
 - Heart disease
- Risk factors associated with chronic diseases
- Lifestyle modifications for disease prevention
- Screening, early detection, and health monitoring
- Health promotion strategies for disease prevention
- Importance of preventive healthcare and wellness practices

References

- Donatelle, R. J. (2021). *Health: The Basics*. Pearson Education.
- Hales, D. (2020). *An Invitation to Health*. Cengage Learning.
- Park, K. (2023). *Park's Textbook of Preventive and Social Medicine*. Bhanot Publishers.
- Taylor, S. E. (2018). *Health Psychology*. McGraw-Hill Education.
- World Health Organization (WHO). (2022). *Mental Health and Well-being*. WHO Publications.

Fourth Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 401	Clinical Biochemistry and Pathophysiology	3	1	4	30	70	100
BND 402	National Health and Nutrition Programs and Policies	3	1	4	30	70	100

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

BND 403	Micronutrients in Human Nutrition	4	-	4	30	70	100
BND 404	Functional Foods and Nutraceuticals	3	1	4	30	70	100
BND 405	Advanced Dietetics	3	1	4	30	70	100
BND 406	Food Safety and Standards	2	-	2	30	70	100
VAC	Environmental Awareness	2	-	2	100	-	100
TOTAL		20	4	24	280	420	700

BND 401 CLINICAL BIOCHEMISTRY AND PATHOPHYSIOLOGY

L-3/T/P-1/C-4

Course Outcomes (CO)

- Explain the physiology, biochemistry, and pathology of major organ systems and metabolic processes.
- Interpret the pathogenesis and clinical manifestations of common diseases related to nutrition and metabolism.
- Apply clinical and biochemical knowledge in nutritional assessment and diet planning for disease management.
- Analyze the relationship between nutrition, metabolic alterations, and pathological conditions.
- Develop evidence-based nutritional strategies for prevention and management of clinical disorders.

Program Outcomes (PO)

- Acquire advanced knowledge in clinical nutrition, biochemistry, and pathology for healthcare practice.
- Integrate scientific principles with nutritional care in health promotion and disease management.
- Demonstrate critical thinking and problem-solving skills in clinical and therapeutic nutrition.
- Interpret laboratory, biochemical, and pathological data for nutritional assessment and intervention.
- Practice ethical, professional, and evidence-based approaches in nutrition and dietetics.

Learning Objectives

- Understand the physiology and biochemical functions of major body systems.
- Study the etiology, pathogenesis, and clinical manifestations of diseases affecting different organs.

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- Examine metabolic alterations associated with endocrine, gastrointestinal, cardiovascular, renal, and respiratory disorders.
- Correlate biochemical and pathological changes with nutritional requirements and therapeutic interventions.
- Gain knowledge of disease prevention and management through appropriate nutrition care.

Learning Outcomes

- Describe the physiological and pathological basis of major clinical disorders.
- Explain biochemical pathways and metabolic disturbances associated with diseases.
- Assess the nutritional implications of endocrine, gastrointestinal, cardiovascular, renal, pulmonary, and metabolic disorders.
- Apply clinical biochemistry and pathology concepts in therapeutic diet planning.
- Evaluate disease conditions and recommend suitable nutrition interventions for patient care.

SYLLABUS

UNIT I

Nutrition, Energy Metabolism and Weight Management

9 Hours

1. Concepts and principles of nutrition and health
2. Energy metabolism and energy balance
3. Assessment and classification of nutritional status
4. Weight management: obesity, underweight, and related complications
5. Role of nutrition in prevention and management of metabolic disorders

UNIT II

Endocrine System and Dental Health

9 Hours

Endocrine System

1. Physiology and functions of endocrine glands
2. Hormonal regulation and metabolic functions
3. Disorders of the endocrine system: diabetes mellitus, thyroid disorders, adrenal disorders, and pituitary disorders

Dental Health

4. Structure and functions of teeth and oral cavity
5. Pathogenesis of dental diseases
6. Dental caries, periodontal diseases, and oral infections
7. Prevention and treatment of dental disorders

UNIT III

Bone Health and Gastrointestinal System

9 Hours

Bone Health

1. Physiology and functions of the skeletal system
2. Bone metabolism and mineral homeostasis
3. Pathophysiology of bone diseases: osteoporosis, osteomalacia, arthritis, and rickets

Gastrointestinal System

4. Physiology and functions of the digestive system
5. Digestion, absorption, and metabolism of nutrients
6. Disorders of the gastrointestinal tract: peptic ulcer, gastritis, inflammatory bowel disease, malabsorption syndromes, and constipation

UNIT IV

Hepatobiliary, Pancreatic, Cardiovascular and Pulmonary Systems

9 Hours

Liver, Gallbladder and Pancreas

1. Physiology and functions of liver, gallbladder, and pancreas
2. Disorders of liver, gallbladder, and pancreas
3. Hepatitis, cirrhosis, gallstones, pancreatitis, and pancreatic insufficiency

Cardiovascular System

4. Physiology and functions of the circulatory system
5. Hypertension, atherosclerosis, coronary artery disease, and heart failure

Pulmonary System

6. Physiology and functions of the respiratory system
7. Disorders of the respiratory system: asthma, COPD, pneumonia, and tuberculosis

UNIT V

Cancer, Inborn Errors of Metabolism and Renal System

9 Hours

Cancer

1. Pathogenesis and clinical manifestations of cancer
2. Nutritional implications in cancer

Inborn Errors of Metabolism

3. Introduction to metabolic pathways and genetic metabolic disorders

4. Pathogenesis and clinical manifestations of inborn errors of metabolism

Renal System

5. Physiology and functions of the excretory system
6. Disorders of the renal system: acute kidney injury, chronic kidney disease, nephrotic syndrome, and renal failure

Practical

30 Hours

UNIT I: Preparation of Standards and Urine Analysis

1. Standardization Techniques

- Preparation of primary standard (Succinic acid) for titration of alkali

2. Urine Analysis

- Collection and preservation of urine samples
- Physical examination of urine
- Qualitative estimation of normal constituents of urine
- Qualitative estimation of abnormal constituents of urine
- Routine biochemical urine analysis using multisticks
- Microscopic examination of urine (Demonstration)

3. Determination of pH of Biological Samples (Demonstration)

- Blood
- Urine
- Saliva
- Plasma

UNIT II: Hematological Investigations

4. Blood Analysis

- Collection and handling of blood samples
5. Determination of Erythrocyte Sedimentation Rate (ESR)
 6. Determination of Clotting Time and Bleeding Time
 7. Estimation of Hemoglobin
 8. Estimation of Blood Glucose
 9. Blood Sugar Monitoring

UNIT III: Biochemical Analysis of Serum Constituents

10. Quantitative Estimation of Serum Constituents

- Bilirubin
- Creatinine
- Urea

- Total proteins
- Albumin

11. Lipid Profile Analysis (Enzymatic Kit Methods)

- Total Cholesterol
- HDL Cholesterol (HDLc)
- LDL Cholesterol (LDLc)
- Serum Triglycerides
- VLDL

12. Electrolyte Estimation Using Flame Photometer

- Sodium
- Potassium
- Chloride

UNIT IV: Enzyme Assay

13. Assay of Salivary Amylase (Kit Method)

UNIT V: Clinical Diagnostic Applications

14. Interpretation and Clinical Significance of Laboratory Investigations

- Correlation of urine analysis findings with disease conditions
- Interpretation of hematological investigations
- Clinical significance of serum biochemical parameters
- Application of biochemical investigations in diagnosis and monitoring of diseases

Reference Books

- Principles of Biochemistry Voet, D., Voet, J., & Pratt, C. W. (2013). *Principles of Biochemistry* (4th ed., International Student Version). John Wiley & Sons, Inc.
- Biochemistry Satyanarayana, U., & Chakrapani, U. (2013). *Biochemistry* (4th ed.). Elsevier.
- Biochemistry Berg, J. M., Tymoczko, J. L., & Stryer, L. (2012). *Biochemistry* (7th ed.). W. H. Freeman and Company.
- A Textbook of Biochemistry Rama Rao, A. V. S. S., & Suryalakshmi, A. (2009). *A Textbook of Biochemistry* (11th ed.). UBS Publishers' Distributors Pvt. Ltd.
- Lehninger Principles of Biochemistry Lehninger, A. L., Cox, M. M., & Nelson, D. L. (2004). *Lehninger Principles of Biochemistry* (4th ed.). W. H. Freeman Company.
- Medical Biochemistry Baynes, J., & Dominiczak, M. (2002). *Medical Biochemistry*. Mosby.
- Harper's Biochemistry Murray, R. K., Granner, D. K., Mayes, P. A., & Rodwell, V. W. (2000). *Harper's Biochemistry*. McGraw-Hill.
- Biochemistry Stryer, L. (1997). *Biochemistry* (4th ed.). W. H. Freeman and Company.

Prerequisites / Additional Reading

- Clinical Biochemistry: Metabolic and Clinical Aspects Marshall, W. J., & Bangert, S. K. (2008). *Clinical Biochemistry: Metabolic and Clinical Aspects* (3rd ed.). Churchill Livingstone.
- Textbook of Medical Biochemistry Chatterjee, M. N., & Shinde, R. (1995). *Textbook of Medical Biochemistry* (2nd ed.). Jaypee Brothers Medical Publishers Pvt. Ltd.
- Biochemistry Rastogi, S. C. (1993). *Biochemistry*. Tata McGraw Hill.
- Human Biochemistry Orten, J. M. (1990). *Human Biochemistry* (10th ed.). C. V. Mosby Publishers.
- Textbook of Medical Laboratory Technology Godkar, P. B., & Godkar, D. P. (2003). *Textbook of Medical Laboratory Technology* (2nd ed.). Bhalani Publishing House.
- Varley's Practical Clinical Biochemistry Gowenlock, A. H. (Ed.). (1996). *Varley's Practical Clinical Biochemistry* (6th ed.). CBS Publishers.
- Hawk's Physiological Chemistry Oser, B. L. (Ed.). *Hawk's Physiological Chemistry* (14th ed.). Tata McGraw Hill.
- Basics of Biochemistry *Basics of Biochemistry*.

BND 402 NATIONAL HEALTH AND NUTRITION PROGRAMS AND POLICIES

L-2/T/P-2/C-4

Course Outcomes

- Understand national health and nutrition programs in India.
- Explain the objectives and implementation of nutrition policies.
- Analyze the role of government initiatives in public health improvement.

Program Outcomes

- Apply knowledge of national nutrition programs in community practice.
- Support implementation of public health nutrition policies.
- Promote awareness about government health initiatives.

Learning Objectives

- To study major national health and nutrition programs.
- To understand nutrition policies and their impact on society.
- To learn strategies for community nutrition improvement.

Learning Outcomes

- Identify important health and nutrition programs in India.
- Explain the role of policies in disease prevention and health promotion.
- Participate effectively in community nutrition programs.

SYLLABUS

Unit 1: Universal Health Coverage and Health Systems in India

(6 Hours)

- Concept of Universal Health Coverage (UHC)
- Universal Health Coverage and the World Health Organization (WHO)
- Universal Health Coverage policies by Government of India
- National Health Mission (NHM)
- National Rural Health Mission (NRHM)
- National Urban Health Mission (NUHM)
- Goals and objectives of national health missions
- Structure of health systems in India
- Role of central and state governments in health care delivery

Unit 2: National Health and Nutrition Programs and Policies

(6 Hours)

- National health and nutrition programs by the Ministry of Health and Family Welfare
- Overview, organograms, and objectives of major programs
 - MAA (Mothers' Absolute Affection)
 - Janani Suraksha Yojana (JSY)
 - Janani Shishu Suraksha Karyakram (JSSK)
 - Other national health initiatives
- Principles of health and nutrition programme management
 - Program design
 - Planning
 - Implementation
 - Operational monitoring
 - Surveillance
 - Evaluation

Unit 3: Health Economics and Nutrition Programme Evaluation

(6 Hours)

- Introduction to health economics
- Macroeconomics and microeconomics in healthcare
- Health and nutrition budgeting in India
- Analysis of health and nutrition budgets in relation to
 - Burden of disease
 - Overnutrition
 - Undernutrition
 - Micronutrient malnutrition
- Concepts of
 - Cost-benefit analysis
 - Cost-effectiveness analysis
 - Cost-efficiency analysis
- Economic evaluation of health and nutrition programs

Unit 4: National Nutrition Mission and Child Welfare Programs

(6 Hours)

- National Nutrition Mission of India
- POSHAN 2.0
- National programs by the Ministry of Women and Child Development
- Integrated Child Development Services (ICDS) Scheme
 - Universalization of ICDS with quality
 - ICDS in mission mode
 - Objectives and target groups
 - Monitoring system
 - Mode of implementation
 - Administrative setup
 - Coverage, compliance, and impact
- PM POSHAN (Mid-Day Meal/Nutritious Meal Programme)
- Role of supplementary nutrition programs in public health

Unit 5: National Programs for Micronutrient Deficiencies and NCD Control

(6 Hours)

- National programs to combat micronutrient malnutrition
 - Anemia Mukht Bharat
 - Nutritional Anaemia Control Programme
 - National Iron Plus Initiative (NIPI/I-NIPI)
 - National Deworming Campaign
 - Vitamin A Prophylaxis Programme (VAPP)
 - National Iodine Deficiency Disorders Control Programme (NIDDCP)
 - Universal Salt Iodization (USI)
 - Double Fortified Salt (DFS)
 - Diarrhoea Control Programme: Role of Zinc and ORS
 - Fluorosis Control Programme
- National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS)
- Rising burden of non-communicable diseases (NCDs)
- Public health strategies for prevention and control of NCDs
- Objectives and key strategies of NPCDCS

PRACTICAL

(60 Hours)

1. Critical appraisal of existing interventions and government programs and suggestions for improving the same
2. Field exposure in the operational public nutrition programs, Nutrition rehabilitation centers
3. Budget and cost analysis of nutrition programmes.

Reference Books

- Park's Textbook of Preventive and Social Medicine Park, K. (2023). *Park's Textbook of Preventive and Social Medicine* (27th ed.). Banarsidas Bhanot Publishers, Jabalpur. ISBN: 9789382219194.
- Public Health Nutrition in Developing Countries Vir, S. C. (Ed.). (2011). *Public Health Nutrition in Developing Countries* (2nd ed., Vols. 1–2). Woodhead Publishing India Pvt. Ltd. ISBN: 9789388320351.
- Child, Adolescent and Women Nutrition in India Vir, S. C. (Ed.). (2023). *Child, Adolescent and Women Nutrition in India: Public Policies, Programmes, and Progress*. Taylor & Francis. Kindle Edition.

Webliography

- [RMNCAH+N – National Health Mission](#)
- [PM POSHAN Scheme Guidelines – Ministry of Education, Government of India](#)
- [Anaemia Mukta Bharat – National Health Mission](#)

BND 403 MICRONUTRIENTS IN HUMAN NUTRITION

L-4/T/P/C-4

Course Outcomes

- Understand the functions of vitamins and minerals in the body.
- Explain sources, requirements, and metabolism of micronutrients.
- Identify deficiency and toxicity disorders related to micronutrients.

Program Outcomes

- Apply micronutrient knowledge in nutritional assessment and counseling.
- Promote prevention of micronutrient deficiencies.
- Support healthy dietary practices for overall well-being.

Learning Objectives

- To study vitamins and minerals and their functions.
- To understand micronutrient requirements and sources.
- To learn deficiency disorders and preventive measures.

Learning Outcomes

- Explain the role of micronutrients in health maintenance.
- Identify symptoms of deficiency and toxicity disorders.
- Recommend dietary sources rich in micronutrients.

SYLLABUS

Unit 1: Flavours in Foods

(12 Hours)

- Definition and classification of flavours
- Extraction and purification of flavours
- Natural and synthetic flavours
- Flavour compounds in foods
 - Terpenoids
 - Flavonoids
 - Polyphenols
 - Sulphur compounds
 - Volatile flavour compounds in plant and animal foods
- Analysis of flavour compounds
 - High Performance Liquid Chromatography (HPLC)
 - Gas Chromatography (GC)
 - Gas Chromatography–Mass Spectrometry (GC-MS)
- Sensory assessment of flavours
- Concepts of flavour retention, flavour modification, and flavour enhancement
- Taste modification and taste enhancement
- Flavours produced during fermentation
 - Wines
 - Fermented milk products
 - Fermented meat products

Unit 2: Pigments and Colour in Foods

(12 Hours)

- Pigments in animal foods
 - Structure and function of hemoglobin and myoglobin
 - Chemical transformation of pigments
 - Stability of myoglobin in cured meats
 - Role of nitrates and cure accelerators in colour fixation
- Pigments in plant foods
 - Classification and properties of pigments
 - Chlorophyll
 - Carotenoids
 - Anthocyanins
 - Betalaines
- Pigment behaviour and colour changes during processing and cooking
- Effect of acidic and alkaline media on pigments
- Techniques for colour extraction, retention, and estimation
- Synthetic colourants
 - Permitted and non-permitted colours
 - Dyes and lakes
 - Advantages and disadvantages

- Safety regulations of food colours
- Production of synthetic colours through azo coupling

Unit 3: Vitamins – Chemistry and Stability

(12 Hours)

- Classification of vitamins
- Requirements, allowances, toxicity, losses, retention, and optimization
- Fat-soluble vitamins
 - Vitamins A, D, E, and K
 - Structure and general properties
 - Stability and degradation mechanisms
 - Factors affecting absorption and bioavailability
- Water-soluble vitamins
 - Thiamin
 - Riboflavin
 - Niacin
 - Ascorbic acid
 - Vitamin B6
 - Folic acid
 - Biotin
 - Vitamin B12 (Cyanocobalamin)
- Stability, degradation, absorption, and bioavailability of water-soluble vitamins

Unit 4: Minerals and Antinutritional Factors

(12 Hours)

- Nutritional aspects and composition of minerals in foods
- Chemical and functional properties of minerals
- Macrominerals
 - Calcium
 - Phosphorus
 - Magnesium
 - Sodium
 - Potassium
 - Chloride
 - Sulphur
- Microminerals
 - Iron
 - Zinc
 - Copper
 - Molybdenum
 - Selenium
 - Iodine
 - Chromium
 - Manganese

- Requirements, allowances, absorption, and bioavailability of minerals
- Toxicity of macro and microminerals
- Mineral losses, leaching, retention, and optimization
- Chemistry of antinutritional factors
 - Saponins
 - Phytic acid
 - Hemagglutinins
 - Lectins

Unit 5: Enzymes and Their Role in Food Processing

(12 Hours)

- Introduction to food enzymes
- Classification and types of enzymes used in food processing
- Mechanism of enzyme action in foods
- Role of enzymes in food processing and preservation
- Enzymatic changes affecting food quality
- Industrial applications of enzymes in food products
- Importance of enzymes in improving texture, flavour, and shelf life

Reference Books

- Food Facts and Principles Manay, N. S., & Shadaksharaswamy, M. (2001). *Food Facts and Principles* (2nd ed.). New Age International (P) Ltd. Publishers, New Delhi.
- Food Chemistry Aurand, L. W., & Woods, A. E. (1973). *Food Chemistry*. The AVI Publishing Company, Inc., Westport, Connecticut.
- Experimental Food Chemistry Mondy, N. I. (1980). *Experimental Food Chemistry*. AVI Publishing Company, Inc., Westport, Connecticut.
- Food Chemistry Fennema, O. R. (1996). *Food Chemistry* (3rd ed.). Marcel Dekker, Inc., New York, USA.
- Food Chemistry Belitz, H. D. (2009). *Food Chemistry* (4th ed.). Springer.

BND 404 FUNCTIONAL FOODS AND NUTRACEUTICALS

L-3/T/P-1/C-4

Course Outcomes

- Understand the concept of functional foods and nutraceuticals.
- Explain the health benefits of bioactive food components.
- Analyze the role of nutraceuticals in disease prevention.

Program Outcomes

- Promote the use of functional foods for health improvement.
- Apply knowledge of nutraceuticals in nutrition practice.
- Support preventive healthcare through dietary interventions.

Learning Objectives

- To study functional foods and nutraceutical products.
- To understand bioactive compounds and their benefits.
- To learn the therapeutic role of nutraceuticals.

Learning Outcomes

- Identify commonly used functional foods and nutraceuticals.
- Explain their role in health promotion and disease prevention.
- Recommend suitable functional foods for healthy living.

Syllabus

Unit 1: Introduction to Functional Foods and Nutraceuticals

(9 Hours)

- Definition and concept of functional foods and nutraceuticals
- History and development of functional foods
- Classification of functional foods
 - Designer foods
 - Pharma foods
 - Nutritional supplements
- Health effects and benefits of functional foods
- Stages involved in the development of functional foods
- Scope and applications of nutraceuticals in health promotion

Unit 2: Classification and Categorization of Nutraceuticals

(9 Hours)

- Classification of nutraceuticals based on
 - Food source
 - Mechanism of action
 - Chemical nature
- Isoprenoids and phenolic substances
- Fatty acids and structural lipids
- Terpenoids
 - Saponins
 - Tocotrienols
 - Simple terpenes
- Carbohydrate-based and amino acid-based derivatives
- Isoflavones and their functional significance
- Bioactive compounds and their role in disease prevention

Unit 3: Probiotics, Prebiotics, and Synbiotics

(9 Hours)

- Concept and importance of probiotics
- Human gastrointestinal tract and gut microbiota
- Classification of probiotics
- Role of probiotics in health and disease management
- Concept and significance of prebiotics
- Types of prebiotics
 - Oligosaccharides
 - Dietary fiber
 - Resistant starch
 - Gums
- Spirulina as a bioactive component
- Synbiotics and their applications in nutrition and health

Unit 4: Functional Components and Bioactive Compounds

(9 Hours)

- Functional nature of nutraceuticals
- Polyphenols and their health benefits
 - Flavonoids
 - Catechins
 - Isoflavones
 - Tannins
- Phytoestrogens and phytosterols
- Glucosinolates and pigments
- Organosulphur compounds
- Proteins and peptides
- Conjugated linoleic acid (CLA)
- Omega-3 fatty acids
- Important bioactive compounds
 - Saponins
 - Hemagglutinins
 - Resveratrol
 - Kaempferol
 - Quercetin
 - Cinnamaldehyde
 - Luteolin
 - Capsaicin
 - Piperine
 - Gingerol
 - Eugenol
 - Rosmarinic acid
 - Apigenin
 - Thymoquinone

Unit 5: Regulatory Aspects and Applications of Functional Foods

(9 Hours)

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- Regulatory aspects of functional foods and nutraceuticals
- International regulations and standards
- National regulatory aspects in India
- Food safety and quality control in functional foods
- Labeling and health claims of nutraceutical products
- Role of regulatory agencies in functional food development
- Applications of functional foods in disease prevention and health promotion

PRACTICALS

(30 Hours)

1. Preparation of Sample
2. Methods of Extraction
3. Qualitative analysis of Primary metabolites
4. Qualitative analysis of Secondary metabolites
5. Qualitative analysis of Vitamins
6. Determination of Total Phenols and Flavonoids
7. Development of Functional food products

Text Books

- Functional Foods: Concept to Product Gibson, G. R., & Williams, C. M. (2000). *Functional Foods: Concept to Product*. CRC Press. ISBN: 9780849308512.
- Handbook of Nutraceuticals and Functional Foods Wildman, R., Wallace, T. C., & Wildman, R. E. C. (2016). *Handbook of Nutraceuticals and Functional Foods* (2nd ed.). CRC Press. ISBN: 9781498770637.
- Essentials of Functional Foods Schmidl, M. K., & Labuza, T. P. (2000). *Essentials of Functional Foods*. Aspen Publishers Inc., U.S. ISBN: 9780834212619.

Reference Books

- Dietary Supplements and Functional Foods Webb, G. P. (2011). *Dietary Supplements and Functional Foods* (2nd ed.). Wiley-Blackwell.
- A Guide to Phytochemical Analysis Balamurugan, V., Fatima, S. M., & Velurajan, S. (2019). *A Guide to Phytochemical Analysis. International Journal of Advance Research and Innovative Ideas in Education*, 5(1), 236–245.
- Food Safety and Standards Act, 2006, Rules and Regulations Nijhawan, R. (2024). *Food Safety and Standards Act, 2006, Rules & Regulations* (25th ed.). ILBCO India. ISBN: 9788194507123.
- Regulation of Functional Foods and Nutraceuticals Hasler, C. M. (2005). *Regulation of Functional Foods and Nutraceuticals*. Wiley-Blackwell. ISBN: 9780813811772.

Webliography

- [MDPI – Nutraceuticals and Functional Foods](#)
- [University of Westminster – Centre for Nutraceuticals](#)

BND 405 ADVANCED DIETETICS

Course Outcomes

- Understand advanced principles of dietetics and therapeutic nutrition.
- Develop dietary plans for various disease conditions.
- Apply diet counseling techniques in clinical settings.

Program Outcomes

- Provide effective nutritional care for patients.
- Apply dietetic principles in disease management.
- Promote evidence-based nutrition therapy.

Learning Objectives

- To study advanced concepts in diet therapy.
- To understand nutritional management of diseases.
- To learn diet planning and counseling skills.

Learning Outcomes

- Prepare therapeutic diets for different clinical conditions.
- Assess nutritional needs of patients accurately.
- Demonstrate effective diet counseling techniques.

Syllabus

Unit 1: Cardiovascular Diseases and Medical Nutrition Therapy

(9 Hours)

- Overview of cardiovascular diseases
- Hypertension
- Hyperlipidemia
- Atherosclerosis
- Ischemic Heart Disease
 - Compensated
 - Decompensated
- Cardiac function tests
- Congestive heart failure
- Rheumatic heart disease
- Medical Nutrition Therapy (MNT) for cardiovascular disorders
- Dietary modifications and lifestyle management in heart diseases

Unit 2: Diabetes Mellitus and Metabolic Disorders

(9 Hours)

- Introduction and classification of Diabetes Mellitus
- Metabolic syndrome and prediabetes
- Dietary management of metabolic disorders
- Medical Nutrition Therapy for
 - Type 1 Diabetes
 - Type 2 Diabetes
 - Gestational Diabetes
- Pharmacotherapy in diabetes and relationship with diet
- MNT for diabetes in special conditions
- Acute and chronic complications of Diabetes Mellitus and their management
- Diabetes education and counseling

Unit 3: Renal Diseases and Nutritional Management

(9 Hours)

- Structure and functional units of the kidney
- Etiology and clinical findings of renal diseases
- Medical Nutrition Therapy for
 - Glomerulonephritis
 - Nephrotic syndrome
 - Acute renal failure
 - Chronic kidney disease
 - Renal replacement therapy
 - Renal transplant
 - Renal calculi
- Protein requirements in renal disease
- Electrolyte and fluid balance in renal disorders
- Sodium, potassium, phosphorus exchange, and acid-base balance in renal disease

Unit 4: Enteral, Parenteral Nutrition and Pulmonary Disorders

(9 Hours)

- Enteral nutrition
 - Principles
 - Formulations
 - Indications and contraindications
 - Management of complications
- Parenteral nutrition
 - Principles
 - Formulations
 - Indications and contraindications
 - Management of complications
- Medical Nutrition Therapy for pulmonary diseases
 - Bronchitis
 - Asthma
 - Chronic Obstructive Pulmonary Disease (COPD)

- Nutritional care in respiratory disorders

Unit 5: Food-Drug Interactions and Nutritional Pharmacology

(9 Hours)

- Food and drug interactions in common disease conditions
- Dietary guidelines during medication therapy
- Effect of nutritional status on drug utilization
- Impact of nutritional deficiencies on drug efficacy
- Role of nutrition in enhancing therapeutic outcomes
- Clinical considerations in nutrition and pharmacotherapy

PRACTICAL

UNIT 1

(6 Hours)

Cardiovascular Diseases

Planning Diets for the following conditions:

- Hypertension
- Hyperlipidemia
- Atherosclerosis
- Ischemic Heart Disease (Compensated and Decompensated)
- Congestive Heart failure

UNIT 2

(6 Hours)

Diabetes Mellitus and Metabolic Disorders

Planning diets for the following Conditions:

- Metabolic syndrome, Prediabetes and other disorders
- Type 1 Diabetes, type 2 Diabetes and Gestational Diabetes.
- Complications of Diabetes Mellitus (Acute and Chronic) and its Management.
- Education and Counseling in Diabetes

UNIT 3

(6 Hours)

Renal Diseases

- Planning diets for the following Conditions: Glomerulonephritis; Nephrotic Syndrome; Acute Renal Failure; Chronic kidney Disease; Renal Replacement Therapy; Renal Transplant; Renal Calculi. Focus on Protein Requirements, Electrolyte and fluid Balance with the progression of renal disease. Development of protein, sodium, potassium, and phosphorus Exchange in renal disease.

UNIT 4

(6 Hours)

Enteral and Parenteral Nutrition

- Market survey of Enteral Formulations; Demonstration of preparation of enteral feeds. Basic orientation for parenteral feeds in a clinical setting.

UNIT 5

(6 Hours)

Pulmonary Disease

- Planning diets for the following Conditions: Range of pulmonary disease - bronchitis, asthma, Chronic Obstructive Pulmonary Disease.

UNIT 5

(6 Hours)

Cancer

- Understand the role of the registered dietitian in the oncology setting, Nutrition screening and assessment in oncology, Understand how caloric needs of cancer patients are affected by the treatment phase (pretreatment, during treatment, post-treatment), Describe how different types of cancer treatment (including chemotherapy, radiation, surgery, and immunology) affect food intake

Reference Books

- Krause and Mahan's Food and the Nutrition Care Process Raymond, J. L., & Morrow, K. (2022). *Krause and Mahan's Food and the Nutrition Care Process* (16th ed.). Elsevier, St. Louis, MO.
- Advanced Medical Nutrition Therapy Practice Skipper, A. (2009). *Advanced Medical Nutrition Therapy Practice*. Jones & Bartlett Learning.
- Clinical Nutrition for Surgical Patients Marian, M., Russell, M. K., & Shikora, S. A. (2008). *Clinical Nutrition for Surgical Patients*. Jones & Bartlett Learning.
- Manual of Dietetics Practice Thomas, B. (Ed.). (1994). *Manual of Dietetics Practice*. Blackwell Scientific Publication.
- Perspectives in Nutrition Wardlaw, G., & Hampl, J. S. (1999). *Perspectives in Nutrition* (4th ed.). McGraw-Hill Education.
- Applications of Clinical Nutrition Zeman, F. J., & Ney, D. M. (1988). *Applications of Clinical Nutrition*. Prentice-Hall International.
- Modern Nutrition in Health and Disease Shils, M. E., Olson, J. A., Shike, M., & Ross, A. C. (Eds.). (1994). *Modern Nutrition in Health and Disease* (8th ed.). Lea & Febiger.
- Nutrition and Diet Therapy Williams, S. R. (1993). *Nutrition and Diet Therapy* (7th ed.). Mosby Year Book, Inc.
- Nutrition in Health and Disease Anderson, L., & Dibble, M. V. (1982). *Nutrition in Health and Disease* (17th ed.). J. B. Lippincott Company.
- Manual of Nutritional Therapeutics Alpers, D. H., Stenson, W. F., Bier, D. M., & Taylor, B. E. (Eds.). (1995). *Manual of Nutritional Therapeutics* (3rd ed.). Little, Brown and Company.

BND 406 FOOD SAFETY AND STANDARDS

L-2/T/P/C-2

Course Outcomes

- Understand principles of food safety and hygiene.
- Explain food laws and standards related to food quality.
- Apply safe food handling and sanitation practices.

Program Outcomes

- Promote food safety awareness in communities.
- Ensure hygienic practices in food preparation and storage.
- Support quality assurance in food service systems.

Learning Objectives

- To study food safety regulations and standards.
- To understand food contamination and prevention methods.
- To learn sanitation and hygiene practices.

Learning Outcomes

- Identify causes of food contamination and spoilage.
- Apply food safety and hygiene practices effectively.
- Explain the importance of food standards and regulations.

Syllabus

UNIT 1

(6 Hours)

Food hygiene concepts Importance of food hygiene and sanitation in a

- a. Community setting,
 - b. Hospital setting and
 - c. Food businesses
- Selection and purchase of food
- a. Receiving and storing food safely
 - b. Preparing and holding food safely
 - c. serving safe food
 - d. storing cooked food safely
 - e. Personal Hygiene

UNIT 2

(6 Hours)

Food safety and contaminants -biological, physical or chemical nature.

- a. Importance in food security and associate different contaminants with risks and relevance to food safety and food safety.
- b. Precautions against contamination
- c. Risk Analysis
- d. Know and define risk analysis
- e. HACCP system, characterize each phase and apply the system to case studies – collective restoration

UNIT 3

(6 Hours)

Storage temperatures; relative humidity of the environment; presence and concentration

- a. Identify temperatures in food processing and conservation;
- b. Identify the humidity reference values;
- c. Identify the importance of air quality in food hygiene.

d. Importance of water and sanitation as an important element in food, hygiene and health promotion.

e. Strengthening sustainable WASH programming (UNICEF / WHO guidelines)

UNIT 4

(6 Hours)

Pest control and waste management

a. Insect, rodent and bird infestation

b. Use of pesticides and Integrated pest management

c. Waste disposal- Solid waste, Liquid waste, ETP

UNIT 5

(6 Hours)

Food Standards -Legal and regulatory documents related to food safety

a. Codex

b. FSSAI

c. Food Hygiene and Safety Audits

d. Define audit and phases of an audit

References/ Text Books

• Roday S. (2017) Food Hygiene and Sanitation, 2nd Edition, Tata Mc Graw Hill Publication. ISBN: 978-0070700208

• Food Safety and Standards (Licensing & Registration of Food Businesses) Regulations, 2011. (<http://www.fssai.gov.in/home/fss-legislation/fss-regulations.html>)

• Food Safety & Standard Act, 2006 (<http://www.fssai.gov.in/home/fss-legislation/food-safety-and-standards-act.html>)

• <http://www.who.int/news-room/fact-sheets/detail/food-safety>

VAC- Environmental Awareness

L-2/T/P/C-2

Course Outcomes

- Understand environmental concepts
- Explain interaction between humans and environment

Program Outcomes

- Promote sustainability and health
- Apply environmental knowledge in daily life

Learning Objectives

- Learn environmental issues
- Understand conservation methods

Learning Outcomes

- Demonstrate environmental responsibility
- Apply sustainable practices

SYLLABUS

UNIT I: Introduction to Environmental Awareness and Ecosystems

6 Hours

Introduction to Environmental Awareness

- Meaning and importance of environmental awareness
- Importance of environmental education
- Key environmental concepts
 - Ecosystems
 - Biodiversity
 - Sustainability
- Historical perspective of environmental awareness

Earth's Ecosystems and Biodiversity

- Concept and structure of ecosystems
- Types of ecosystems
 - Forest ecosystems
 - Ocean ecosystems
 - Wetland ecosystems
 - Grassland ecosystems
- Importance of biodiversity
- Threats to biodiversity
 - Habitat loss
 - Invasive species
 - Climate change

UNIT II: Pollution and Climate Change

6 Hours

Pollution and Its Impact

- Types of pollution
 - Air pollution
 - Water pollution
 - Soil pollution
 - Noise pollution
 - Light pollution
- Causes and effects of pollution on human health and ecosystems
- Major pollution incidents and case studies

Climate Change and Global Warming

- Science of climate change
- Greenhouse effect and global warming
- Human contributions to climate change
- Impacts of climate change
 - Rising temperatures
 - Sea level rise
 - Extreme weather events
- Climate change mitigation and adaptation strategies

UNIT III: Resource Conservation and Sustainable Food Systems

6 Hours

Resource Conservation

- Renewable and non-renewable resources
- Importance of conserving water, energy, and natural resources
- Conservation methods
 - Recycling
 - Energy efficiency
 - Water-saving practices

Sustainable Agriculture and Food Systems

- Environmental impacts of conventional agriculture
- Sustainable agriculture practices
 - Organic farming
 - Permaculture
 - Agroecology
- Sustainable food systems and food security
- Role of diet and nutrition in environmental sustainability

UNIT IV: Waste Management and Water Conservation

6 Hours

Waste Management

- Types of waste
 - Municipal waste
 - Industrial waste
 - Hazardous waste
 - Electronic waste
- Principles of waste management
 - Reduce
 - Reuse

- Recycle
- Waste disposal methods
 - Landfills
 - Incineration
 - Composting
- Zero waste lifestyle and sustainable practices

Water Conservation and Management

- Global water crisis and its causes
- Importance of water conservation
- Water management practices and policies
- Importance of clean water for living organisms and ecosystems

UNIT V: Environmental Policies, Green Technologies, and Individual Responsibility

6 Hours

Environmental Policy and Legislation

- International environmental agreements
 - Paris Agreement
 - Kyoto Protocol
- National environmental laws and regulations
- Role of governments, NGOs, and communities in environmental protection

Green Technologies and Innovations

- Renewable energy sources
 - Solar energy
 - Wind energy
 - Hydropower
- Sustainable transportation and electric vehicles
- Innovations in waste-to-energy and sustainable agriculture

Role of Individuals in Environmental Protection

- Impact of individual actions on the environment
- Eco-friendly lifestyles and sustainable consumption
- Green travel and energy conservation
- Community participation and grassroots environmental movements

References

- Miller, G. T., & Spoolman, S. (2018). *Environmental Science*. Cengage Learning.
- Cunningham, W. P., & Cunningham, M. A. (2020). *Environmental Science: A Global Concern*. McGraw-Hill Education.
- Park, K. (2023). *Park's Textbook of Preventive and Social Medicine*. Bhanot Publishers.

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- ErachBharucha (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
- Wright, R. T., &Boorse, D. F. (2017). *Environmental Science: Toward a Sustainable Future*. Pearson Education.

Fifth Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 501	Research Methodology and Statistics	4	-	4	30	70	100
BND 502	Sports Nutrition	2	2	4	30	70	100
BND 503	Tools and Techniques for Nutrition Counselling	1	3	4	30	70	100
BND 504	Nutritional Epidemiology and Anthropology	3	1	4	30	70	100
BND 505	Food Analysis	2	2	4	30	70	100
BND 506	Emerging Concepts in Nutrition and Dietetics	2	-	2	30	70	100
VAC	Interpersonal communication	1	-	1	100	-	100
TOTAL		15	8	23	280	420	700

BND 501 RESEARCH METHODOLOGY AND STATISTICS

L-4/T/P/C-4

Course Outcomes

- Understand the principles of research methodology and biostatistics.
- Explain methods of data collection and analysis.
- Develop skills in interpreting research findings.

Program Outcomes

- Apply research methods in nutrition and dietetics studies.
- Support evidence-based practice through scientific research.
- Enhance analytical and problem-solving skills.

Learning Objectives

- To study types and methods of research.
- To understand statistical tools and techniques.
- To learn data analysis and interpretation methods.

Learning Outcomes

- Conduct basic research in nutrition and health sciences.
- Analyze and interpret statistical data effectively.
- Prepare research reports and presentations systematically.

SYLLABUS

Unit 1: Introduction to Research Methodology

(12 Hours)

- Meaning and importance of research
- Steps involved in the research process
- Types of research
 - Qualitative research
 - Quantitative research
 - Cross-sectional research
 - Longitudinal research
- Examples from published research papers
- Variables and levels of measurement
 - Independent and dependent variables
 - Categorical variables: nominal and ordinal scales
 - Continuous variables
 - Interval and ratio scales
- Primary and secondary data

Unit 2: Methods of Data Collection

(12 Hours)

- Methods of data collection in research
- Questionnaire techniques and questionnaire development
- Interview techniques in research studies
- Dietary data collection methods
 - Food Frequency Questionnaire (FFQ)
 - Dietary recall methods
 - Other dietary assessment techniques
- Merits, demerits, and suitability of different methods for specific studies
- Ethical considerations in data collection

Unit 3: Research Writing and Literature Review

(12 Hours)

- Report writing in research
- Proposal writing and research planning
- Types of research papers
- Interpretation and presentation of research findings
- Referencing and citation methods
- Literature review using search engines and indexed peer-reviewed journals
- Bibliography styles and formatting techniques
- Critical review of scientific literature

Unit 4: Statistical Methods in Research

(12 Hours)

- Measures of central tendency
 - Mean
 - Median
 - Mode
- Measures of dispersion
 - Range
 - Standard deviation
 - Variance
- Statistical tests and interpretation using examples from research papers
 - T-test
 - ANOVA
 - Chi-square test
 - Pearson's correlation
 - Regression analysis
- Levels of significance and interpretation of p-values

Unit 5: Technology and Software Applications in Research

(12 Hours)

- Use of technology in research and statistical analysis
- Designing and conducting surveys using Google Forms

- Excel-based data coding and compilation
- Introduction to SPSS software
- Data entry, analysis, and interpretation using SPSS
- Presentation of statistical results using tables, graphs, and charts

Reference Books

1. Research methodology: methods and techniques (C R Kothari), New age international publishers
2. W. W. Daniel, C. L. Cross. Biostatistics: A Foundation for Analysis in the Health Science, 10/e., Wiley, 2013

BND 502 SPORTS NUTRITION

L-2/T/P-2/C-4

Course Outcomes

- Understand the principles of sports nutrition and energy metabolism.
- Explain nutritional requirements for physical activity and sports performance.
- Develop diet plans for athletes and physically active individuals.

Program Outcomes

- Apply sports nutrition principles in fitness and athletic performance.
- Promote healthy dietary practices for active lifestyles.
- Support performance enhancement through proper nutrition.

Learning Objectives

- To study energy requirements during exercise and sports.
- To understand the role of nutrients in athletic performance.
- To learn hydration and recovery nutrition strategies.

Learning Outcomes

- Explain nutritional needs of athletes and sports persons.
- Plan balanced diets for sports performance and recovery.
- Recommend hydration and supplementation practices appropriately.

Syllabus

Unit 1: Introduction to Sports Nutrition and Physical Fitness

(6 Hours)

- Overview, definition, and scope of sports nutrition
- Concepts of training and exercise
- Nutrition guidelines and principles for sports persons
- Basic nutrients required for athletes
- Physical fitness

- Principles of physical fitness
- Types and components of fitness
- Techniques and methods of measuring physical fitness

Unit 2: Body Composition and Energy Balance

(6 Hours)

- Concept of body composition
- Body composition in different physiological conditions
- Factors affecting body composition
- Methods of assessing body composition
- Energy concept and energy metabolism
- Factors affecting energy requirements
- Methods of measuring energy intake and expenditure
- Concept of energy balance in sports and exercise

Unit 3: Nutrient Metabolism and Hydration in Sports

(6 Hours)

- Macronutrients in sports nutrition
 - Carbohydrates: types, role, timing, and carbohydrate loading
 - Proteins: requirements, sources, timing, and muscle protein synthesis
 - Fats: types, functions, and role during exercise
- Micronutrients important for athletes
- Electrolyte balance and its significance
- Hydration strategies and fluid replacement during exercise and competition
- Role of nutrition in athletic performance and recovery

Unit 4: Nutritional Strategies for Training and Competition

(6 Hours)

- Pre-exercise nutrition
- Intra-exercise nutrition
- Post-exercise recovery nutrition
- Nutritional considerations for different sports
 - Endurance sports
 - Strength sports
 - Team sports
- Sports nutrition products and supplements
 - Energy metabolism supplements
 - Weight reduction supplements
 - Botanical and herbal supplements
- Ergogenic aids and their efficacy
- Safety, regulations, and ethics of supplement use
- Special nutritional considerations for
 - Women athletes

- Young athletes
- Athletes with diabetes
- Vegetarian athletes
- Nutrition for gymnastics, weightlifting, skiing, cycling, swimming, and skating
- Eating disorders and disordered eating in athletes

Unit 5: Emerging Trends, Ethics, and Professional Practice in Sports Nutrition

(6 Hours)

- Advances in sports nutrition research
- Current dietary trends among athletes
- Future directions in sports nutrition
- Professional responsibilities of a sports nutritionist
- Ethical considerations in sports nutrition counseling
- Working with multidisciplinary teams
 - Coaches
 - Trainers
 - Medical professionals
- Role of evidence-based practice in sports nutrition

Practical

(60 Hours)

1. Development of methodology for collection of data on nutritional status
2. Development of methodology for collection of data on physical fitness
3. Clinical and dietary assessment techniques for athletes
4. Clinical and dietary assessment techniques for group activities
5. Assessment of nutritional status of athletes
6. Assessment of nutritional status of group activities
7. Creating and evaluating nutrition plans for athletes
8. Planning diet for energy dense and high protein recipes
9. Planning diet for fat recipes for athletes
10. Planning diet for athletes and endurance sports
11. Planning nutritional requirements for sports injuries
12. Assessment of physical fitness of athletes
13. Assessment of physical fitness of group activities
14. Assessment of body composition of athletes and performed sports activities.
15. Development and standardization of tool for physical fitness.
16. Assessment of physical fitness of men athletes using standard tool
17. Assessment of physical fitness of women athletes using standard tool.
18. Use and practice of ergonomic Ft for assessment of energy expenditure.
19. Market survey of commercially available sports supplements.
20. Visit to a sports academy and fitness centres.

Reference Books

- Nutrition and Metabolism in Sports, Exercise and HealthKang, J., & Barnett, S. R. N. (2022). *Nutrition and Metabolism in Sports, Exercise and Health* (2nd ed.). Routledge Publishing Company.
- Sports Nutrition: Enhancing Athletic PerformanceMaughan, R. J., & Burke, L. M. (2023). *Sports Nutrition: Enhancing Athletic Performance* (3rd ed.). CRC Press.
- Nutrition for Sport, Exercise, and HealthDunford, M. J., Doyle, J. A., & Kalman, D. M. (2021). *Nutrition for Sport, Exercise, and Health* (2nd ed.). Cengage Learning.
- Clinical Sports NutritionBurke, L., & Deakin, V. (2022). *Clinical Sports Nutrition* (6th ed.). McGraw-Hill Education.
- Sports Nutrition for Endurance AthletesRyan, M. (2020). *Sports Nutrition for Endurance Athletes* (3rd ed.). VeloPress.
- Sports and Exercise NutritionMcArdle, W. D., Katch, F. I., &Katch, V. L. (2020). *Sports and Exercise Nutrition* (5th ed.). Wolters Kluwer.
- Performance Nutrition for AthletesAustin, K. G., &Seebohar, B. (2021). *Performance Nutrition for Athletes*. Human Kinetics.
- Practical Applications in Sports NutritionFink, H. H., &Mikesky, A. E. (2015). *Practical Applications in Sports Nutrition* (4th ed.). Jones & Bartlett Learning, Burlington, MA.

Webliography

- [Academy of Nutrition and Dietetics – Fitness Nutrition](#)
- [Nutritionist Resource](#)
- [Sports Oracle](#)
- [Nutrition Australia](#)
- [American College of Sports Medicine – Nutrition](#)
- [International Society of Sports Nutrition](#)
- [Sports Dietitians Australia](#)

BND 503 TOOLS AND TECHNIQUES FOR NUTRITION COUNSELLING

L-1/T/P-6/C-4

Course Outcomes

- Understand principles and methods of nutrition counseling.
- Develop communication and counseling skills for patient care.
- Apply counseling techniques in different healthcare settings.

Program Outcomes

- Provide effective nutrition education and counseling services.
- Promote behavioral changes for healthy dietary practices.
- Improve patient compliance through communication skills.

Learning Objectives

- To study counseling approaches and communication methods.
- To understand patient-centered nutrition care.
- To learn motivational and behavioral counseling techniques.

Learning Outcomes

- Demonstrate effective nutrition counseling skills.
- Communicate dietary advice clearly and professionally.
- Apply counseling techniques for lifestyle modification.

SYLLABUS

Unit 1: Introduction to Dietary Counseling

(3 Hours)

- Definition, expectations, goals, scope, and limitations of dietary counseling
- Responsibilities and role of the nutrition counselor
- Ethical code and professional responsibilities in counseling
- Characteristics of an effective counselor
- Skills and attributes of a nutrition educator and counselor
 - Cultural competency
 - Understanding client perspectives
 - Informed negotiation
 - Empathy and rapport building

Unit 2: Stages of Diet Counseling and Behaviour Change

(3 Hours)

- Stages of diet counseling
 - Stage I: Problem exploration and clarification
 - Stage II: Developing new perspectives and setting goals
 - Stage III: Implementation, follow-up, and evaluation
- Stages of behavior change
 - Precontemplation
 - Contemplation
 - Preparation
 - Action
 - Maintenance
 - Relapse
- Role of counseling in facilitating lifestyle modification

Unit 3: Behaviour Change Models and Counseling Approaches

(3 Hours)

- Behaviour change and factors affecting the ability to change

- Models for behaviour change
 - Health Belief Model
 - Social Cognitive Theory
 - Theory of Planned Behaviour
 - Transtheoretical Model of Change
- Models for educational program development
- Cognitive Behavioral Therapy (CBT)
- Acceptance and Commitment Therapy (ACT)
- Motivational Interviewing (MI)
- Counseling approaches
 - Psychoanalytical approach
 - Cognitive-behavioral approach
 - Humanistic approach
 - Client-centered therapy
 - Gestalt therapy

Unit 4: Facilitating Behaviour Change in Counseling

(3 Hours)

- Expressing empathy in counseling
- Understanding cultural factors affecting dietary behavior
- Developing discrepancy for motivation
- Avoiding arguments and defensiveness
- Rolling with resistance
- Supporting self-efficacy and confidence building
- Communication techniques for effective counseling sessions

Unit 5: Counseling Methods and Managing Resistance Behaviour

(3 Hours)

- Types of counseling
 - Multicultural counseling
 - Motivational counseling
 - Directive counseling
 - Guided counseling
- Components of first counseling sessions and follow-up visits
- Group counseling methods
- Counseling individuals not ready to change vs. unsure about change
- Resistance behaviours and strategies to manage them
 - Reflecting
 - Shifting focus
 - Agreeing with a twist
 - Reframing
 - Ending sessions appropriately
- Ready-to-change counseling sessions
 - Goal setting

- Action planning

PRACTICAL

Unit 1: Development of IEC Materials for Nutrition Education

(18 Hours)

- Introduction to Information, Education, and Communication (IEC) materials
- Preparation of educational models
 - Cardboard models
 - Wax models
 - Food portion models (chapati, bhakri, fruits, vegetables, and food groups)
- Use of diet atlas in nutrition education
- Development of innovative IEC materials
 - Brochures
 - Posters
 - Flash cards
 - Puzzles
 - Games
 - Calendars
- Designing nutrition messages for different target groups

Unit 2: Digital and Social Media Applications in Nutrition Education

(18 Hours)

- Use of social networking sites for imparting nutrition knowledge
- Online nutrition communication strategies
- Planning, preparation, implementation, and testing of IEC materials
- Collecting and analyzing feedback from target groups
- Use of online applications in dietetics
 - Nutritive Calculator
 - Diet Cal
- Role of digital tools in nutrition assessment and counselling

Unit 3: Diet Planning and Nutrition Counseling

(18 Hours)

- Principles of diet planning for various diseases and special conditions
- Preparation of diet charts using nutrition education resources and apps
- Nutritional modifications for therapeutic diets
- Patient-specific meal planning and counselling techniques
- Use of technology in dietary counselling and follow-up

Unit 4: Case Studies in Dietary Counselling

(18 Hours)

- Case study approach in clinical nutrition practice

- Dietary counselling in hospital and clinical settings
- Assessment of patient nutritional needs
- Planning and monitoring therapeutic diets
- Communication skills in patient counselling
- Documentation and presentation of clinical case studies

Unit 5: Practical Applications and Evaluation of Nutrition Education

(18 Hours)

- Practical demonstrations of IEC material usage
- Evaluation of effectiveness of nutrition education tools
- Group and individual counselling techniques
- Community-based nutrition education activities
- Feedback analysis and improvement of counselling strategies
- Integration of digital and traditional nutrition education methods

Reference Books

- Krause's Food, Nutrition and Nutrition Care Process Mahan, L. K., & Escott-Stump, S. (2021). *Krause's Food, Nutrition and Nutrition Care Process* (16th ed.). Elsevier Pvt. Ltd. ISBN: 032381025X.
- Perspectives in Nutrition Wardlaw, G. M., Hampl, J. S., & DiSilvestro, R. A. (2004). *Perspectives in Nutrition* (6th ed.). McGraw Hill. ISBN: 0072921633.
- Apollo Clinical Nutrition Handbook Jatana, A., Daphne, J. K., Shyam, H., Rohtagi, P., & Pandya, K. (2022). *Apollo Clinical Nutrition Handbook*. Jaypee Brothers. ISBN: 9789354650895.
- Textbook of Human Nutrition Bamji, M. S., Krishnaswamy, K., & Brahman, G. N. V. (2009). *Textbook of Human Nutrition* (3rd ed.). Oxford & IBH Publishing Co. Pvt. Ltd.
- Dietetics Srilakshmi, B. (2023). *Dietetics* (9th ed.). New Age Publishers. ISBN: 9395161841.

BND 504 Nutritional Epidemiology And Anthropology

L-4/T/P-0/C-4

Course Outcomes

- Understand the relationship between nutrition, culture, and health.
- Explain epidemiological methods used in nutrition studies.
- Analyze nutritional problems in populations and communities.

Program Outcomes

- Apply epidemiological concepts in nutrition research and public health.
- Promote culturally appropriate nutrition interventions.
- Support community nutrition assessment and planning.

Learning Objectives

- To study epidemiological principles related to nutrition.
- To understand cultural influences on food habits and health.
- To learn methods of nutritional data collection and analysis.

Learning Outcomes

- Identify nutritional problems in populations.
- Explain the impact of culture on dietary practices.
- Interpret basic epidemiological data related to nutrition.

Syllabus

Unit I: Introduction to Epidemiology and Health Measurements

12 Hours

Epidemiology and Public Health Nutrition

- Introduction to Epidemiology
- Definition, uses, and branches of Epidemiology
- Epidemiology and Public Health Nutrition
 - Causation of diseases based on nutritional deficiencies
 - Natural history of diseases due to nutritional deficiencies
 - Health status of populations
 - Evaluation of nutrition and health interventions

Measurements in Health and Disease

- Concepts and measurements in health and disease with special reference to nutrition
- Diagnostic criteria and measures of disease frequency
 - Population at risk
 - Incidence and prevalence
 - Case fatality rate
- Interrelationship of epidemiological measures

Mortality and Morbidity Indicators

- Mortality indicators
 - Death rates
 - Infant mortality rate
 - Child mortality rate
 - Maternal mortality rate
 - Adult mortality rate
 - Life expectancy
 - Age-standardized rates
- Morbidity indicators
 - Disability
 - Health determinants

- Health indicators
- Risk factors

Unit II: Epidemiological Study Designs and Research Methods

12 Hours

Observational Epidemiology

- Descriptive studies
- Ecological studies
- Cross-sectional studies
- Case-control studies
- Cohort studies
- Important nutrition and health-related studies under each category

Experimental Epidemiology

- Randomized controlled trials
- Field trials
- Community trials

Errors and Validity in Epidemiological Studies

- Random error
- Sample size considerations
- Systematic error
- Selection bias
- Measurement bias
- Confounding and control of confounding
- Validity in epidemiological research
- Ethical issues in epidemiological studies

Unit III: Epidemiology of Prevention and Communicable Diseases

12 Hours

Epidemiology and Prevention of Chronic Diseases

- Preventive potential
- Causation framework
- Levels of prevention
 - Primordial prevention
 - Primary prevention
 - Population strategy
 - High-risk individual strategy
 - Secondary prevention
 - Tertiary prevention

Screening

- Types of screening

- Criteria for screening

Communicable Diseases: Surveillance and Response

- Burden of communicable diseases
- Epidemic and endemic diseases
 - Epidemics
 - Endemic diseases
 - Emerging and re-emerging infections

Chain of Infection

- Infectious agent
- Transmission
- Host factors
- Environmental factors

Investigation and Control of Epidemics

- Investigation procedures
- Identification of cases
- Management and control measures
- Surveillance and response systems

Unit IV: Environmental and Occupational Epidemiology

12 Hours

Environment and Health

- Relationship between environment and health
- Impact of exposure to environmental factors
- Evaluation of preventive measures

Exposure and Dose Assessment

- General concepts
- Biological monitoring
- Interpretation of biological data
- Individual versus group measurements
- Population dose
- Dose–effect relationships
- Dose–response relationships

Risk Assessment and Management

- Risk assessment
- Health impact assessment
- Risk management
- Environmental health impact assessment
- Measuring past exposure

- Healthy worker effect in occupational studies

Epidemiology of Foodborne Diseases

- Main foodborne diseases
- Relevance of public health epidemiology and nutritional epidemiology in foodborne diseases

Unit V: Anthropology and Nutrition Health Management

12 Hours

Anthropology and Health

- Types of Anthropology
 - Physical anthropology
 - Sociocultural anthropology
 - Psychological anthropology
 - Linguistic anthropology
 - Cultural anthropology
- Role of anthropology in prevention and treatment of diseases

Methods of Assessing Anthropology

- Ethnographic research methods
 - Mixed methods
 - Observation
 - In-depth interviews
 - Transect walk

Critical Medical Anthropology

- Medical ecological approach in understanding biomedicine and public health
- Global political and economic structures influencing healthcare systems
- Levels of analysis
 - Micro level
 - Intermediate level
 - Macrosocial level

Food and Nutrition Anthropology

- Indian food and nutrition anthropology
- Role in combating health and disease

Reference Books

- Basic Epidemiology Bonita, R., Beaglehole, R., & Kjellström, T. (2006). *Basic Epidemiology*. World Health Organization.
- Workbook of Epidemiology Norell, S. E. (1995). *Workbook of Epidemiology*. Oxford University Press, USA.

- Epidemiology: An Introduction Moon, G., & Gould, M. (2000). *Epidemiology: An Introduction*. McGraw-Hill Education (UK).
- Research Methods for Anthropological Studies of Food and Nutrition Chrzan, J., & Brett, J. (Eds.). (2017). *Research Methods for Anthropological Studies of Food and Nutrition: Volumes I–III* (Vol. 1). Berghahn Books.
- Indian Food Anthropology and the Eat Right Movement – Volume 1 Nambiar, V. (Ed.). (2021). *Indian Food Anthropology and the Eat Right Movement – Volume 1*. Selective & Scientific Books. ISBN: 9788195149223.
- Indian Food Anthropology and the Eat Right Movement – Volume 2 Nambiar, V. (Ed.). (2021). *Indian Food Anthropology and the Eat Right Movement – Volume 2*. Selective & Scientific Books. ISBN: 9788195149247.
- Research Methods in Anthropology Bernard, H. R. (2012). *Research Methods in Anthropology*. AltaMira Press.

Webliography

- ICMR – National Institute of Epidemiology (NIE)

BND 505 FOOD ANALYSIS

L-2/T/P-2/C-4

Course Outcomes

- Understand principles and methods of food analysis.
- Explain techniques used for evaluating food quality and composition.
- Apply analytical methods in food testing and quality control.

Program Outcomes

- Promote food quality and safety standards.
- Apply analytical skills in nutrition and food science practice.
- Support accurate evaluation of food nutrients and contaminants.

Learning Objectives

- To study physical and chemical methods of food analysis.
- To understand laboratory techniques for food testing.
- To learn quality control measures in food analysis.

Learning Outcomes

- Perform basic food analysis procedures.
- Interpret results of food quality assessments.
- Apply analytical techniques in food and nutrition studies.

Syllabus

Unit 1: Introduction to Food Analysis

(6 Hours)

- Need and importance of food analysis
- Objectives and scope of food analysis
- Role of food analysis in quality control and food safety
- Applications of food analysis in food industry and research
- Basic concepts in food quality evaluation

Unit 2: Physical Properties of Foods

(6 Hours)

- Hydrogen ion concentration (pH)
- Oxidation-reduction potentials
- Adsorption
- Isoelectric point of proteins
- Specific gravity and density
- Specific heat capacity
- Surface tension
- Viscosity and plasticity
- Refractive index
- Filth analysis
- Particle size analysis
- Importance of physical properties in food quality assessment

Unit 3: Chemical Properties and Composition of Foods

(6 Hours)

- Moisture content and water activity
- Protein analysis
- Fat analysis
- Volatile oils
- Crude fiber and dietary fiber
- Total ash, acid insoluble ash, and sulphated ash
- Reducing and non-reducing sugars
- Starch estimation
- Principles and significance of chemical analysis in foods

Unit 4: Food Quality Evaluation and Shelf Life Studies

(6 Hours)

- Important food quality attributes
- Sensory quality evaluation
 - Colour
 - Texture
 - Flavor

- Taste
- Microbiological quality assessment
- Nutritional quality evaluation of food products
- Food adulteration and detection methods
- Shelf life studies and storage stability of foods
- Factors affecting shelf life of food products

Unit 5: Properties of Oils, Fats, and Colloidal Systems in Foods

(6 Hours)

- Physical and chemical properties of oils and fats
 - Acid value and free fatty acids
 - Unsaponifiable matter
 - Melting point
 - Solid-liquid ratio
 - Specific gravity
 - Titre value
 - Colour
 - Iodine value
 - Saponification value
 - Acetyl value and hydroxyl value
 - Reichert-Meissl (RM) value
 - Polenske value
 - Rancidity
- Colloidal chemistry of foods
 - Sols
 - Gels
 - Foams
 - Emulsions
- Importance of colloidal systems in food processing and stability

PRACTICAL

(60 Hours)

1. Physical examination of various food grains.
2. Detection of adulteration: Milk, turmeric powder, pure ghee, wheat flour, khoa.
3. Determination of the Moisture content in food sample.
4. Determination of the acid insoluble ash in food sample.
5. Determination of fat content in food sample.
6. Determination of the Crude fibre content in food sample.
7. Determination of the Protein Content in food sample.
8. Calculation of carbohydrate content of food sample on the basis of principle of proximate composition
9. Determination of quality of fats/oils Saponificati Acid value

Reference Books

- Food Chemistry Fennema, O. R. (Ed.). (1996). *Food Chemistry* (3rd ed.). University of Wisconsin, Madison. ISBN: 0-8247-9346-3 / 0-8247-9691-8. [Food Chemistry PDF](#)
- Handbook of Food Chemistry Cheung, P. C. K., & Mehta, B. M. (Eds.). (2015). *Handbook of Food Chemistry*. Springer, Heidelberg, New York, Dordrecht, London. ISBN: 9783642366048. [Handbook of Food Chemistry PDF](#)
- Food Chemistry Belitz, H. D., Grosch, W., & Schieberle, P. (2009). *Food Chemistry* (4th rev. ed.). Springer, Heidelberg, New York, Dordrecht, London. ISBN: 9783540699330. [Food Chemistry by Belitz PDF](#)
- Principles of Food Chemistry DeMan, J. M., Finley, J. W., Hurst, W. J., & Lee, C. Y. (2018). *Principles of Food Chemistry*. Springer, Heidelberg, New York, Dordrecht, London. ISBN: 9783319636054.
- Food Chemistry Meyer, L. H. (2004). *Food Chemistry*. CBS Publishers. ISBN: 9788123911496.
- Physical Properties of Foods Sahin, S., & Sumnu, S. G. (2006). *Physical Properties of Foods (Food Science Text Series)*. Springer-Verlag New York Inc. ISBN: 9780387307800.
- Textbook of Food Chemistry Vaidya, G. (2022). *Textbook of Food Chemistry*. Book Rivers Publications. ISBN: 9789355153159.
- Introduction to Food Chemistry Kontogiorgos, V. (2021). *Introduction to Food Chemistry*. Springer Nature. ISBN: 9783030856441.
- Food Chemistry Iqbal, S. A. (2008). *Food Chemistry*. Discovery Publishing Pvt. Ltd.
- Official Methods of Food Analysis AOAC. (2023). *Official Methods of Food Analysis*. Association of Official Analytical Chemists Inc., Arlington, Virginia, USA.
- Manual of Methods of Food Analysis: Cereals and Cereal Products FSSAI. (2023). *Manual of Methods of Food Analysis: Cereals and Cereal Products*. Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi. [FSSAI Cereals and Cereal Products Manual PDF](#)
- Manual of Methods of Food Analysis: Oils and Fats FSSAI. (2016). *Manual of Methods of Food Analysis: Oils and Fats*. Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi.
- A Manual of Laboratory Techniques Raghuramulu, N., Nair, K. M., & Kalyanasundaram. (2003). *A Manual of Laboratory Techniques*. NIN, Hyderabad.
- Food Analysis and Quality Control: A Practical Manual Yadav, P. *Food Analysis and Quality Control: A Practical Manual*. Government Polytechnic, Mandi Adampur, Hisar, Haryana, India. [Food Analysis and Quality Control Practical Manual PDF](#)
- Experiments and Techniques in Biochemistry Sharma, S. (2007). *Experiments and Techniques in Biochemistry*. Galgotia Publications Pvt. Ltd.
- Textbook of Food Analysis Subramanian, N. S., Ushasree, P., & Reddy, G. N. K. (2022). *Textbook of Food Analysis*. Unique Pub International (UPI).

BND 506 EMERGING CONCEPTS IN NUTRITION AND DIETETICS

L-2/T/P/C-2

Course Outcomes

- Understand recent advances in nutrition and dietetics.
- Explain the role of emerging technologies in nutrition care.
- Analyze new trends in functional foods and personalized nutrition.

Program Outcomes

- Apply updated scientific knowledge in nutrition practice.
- Promote innovative approaches in dietetics and healthcare.
- Support evidence-based nutrition interventions.

Learning Objectives

- To study recent developments in nutrition science.
- To understand personalized and precision nutrition concepts.
- To learn innovative dietary approaches for disease prevention.

Learning Outcomes

- Explain current trends in nutrition and dietetics.
- Identify emerging technologies used in nutrition care.
- Apply updated nutrition concepts in professional practice.

Syllabus

Unit 1: Artificial Intelligence in Nutrition and Dietetics

(6 Hours)

- Introduction to Artificial Intelligence (AI) in healthcare
- Applications of AI in nutrition and dietetics
- Merits and demerits of AI in nutrition practice
- AI-based tools and sources related to nutrition and dietetics
- Role of AI in dietary assessment, meal planning, and patient monitoring
- Career opportunities using AI in dietetics and nutrition research

Unit 2: Nutrigenomics, Nutrigenetics, and Precision Nutrition

(6 Hours)

- Introduction to nutrigenomics and nutrigenetics
- Gene expression
 - Transcription
 - Translation
 - Post-translational modification
- Nutrition in the omics era
 - Epigenetics
 - Transcriptomics

- Proteomics
- Metabolomics
- Genetic variation and nutritional implications
- Nutrient control of gene expression
 - Amino acids
 - Nucleotides
- Nutrigenomics and complex diseases
 - Diabetes
 - Cancer
 - Obesity
- Personalized nutrition and precision nutrition

Unit 3: Microbiome and Human Nutrition

(6 Hours)

- Human gastrointestinal tract and gut microbiota
- Functions of gut microbiota in human health
- Concept and classification of probiotics
- Prebiotics and synbiotics
- Role of probiotics in human nutrition
- Applications of microbiome research in health and disease management
- Relationship between microbiome and immune function

Unit 4: Emerging Trends in Nutrition

(6 Hours)

- Future challenges in feeding a growing global population
- Human Milk Oligosaccharides (HMO) and their significance
- Chrono-nutrition and meal timing
- Nano-nutrition and nanotechnology in food and nutrition
- Emerging innovations in nutritional sciences
- Role of advanced technologies in improving nutrition and health outcomes

Unit 5: New Technologies in Nutrition Research and Practice

(6 Hours)

- Application of food technology in clinical nutrition services
- Smart healthcare systems in nutrition practice
- Telemedicine and digital nutrition counseling
- Mobile applications in nutrition and dietetics
- Wearable devices and nutrition monitoring
- Technology-based nutrition research and data collection
- Future scope of digital health technologies in nutrition care

Reference Books

- Nutrition in Women at High Altitude: A Scoping Review – UIAA Medical Commission Recommendations
Andjelkovic, M., Paal, P., Kriemler, S., Mateikaite-Pipiriene, K., Rosier, A., Beidleman, B. A., Derstine, M., Pichler Hefti, J., Hillebrandt, D., Horakova, L., Jean, D., & Keyes, L. E. (2024). *Nutrition in Women at High Altitude: A Scoping Review – UIAA Medical Commission Recommendations*. *High Altitude Medicine & Biology*, 25(1), 9–15. DOI: 10.1089/ham.2023.0047.
- NASA: Space Food and Nutrition Educator Guide
NASA. (2012). *NASA: Space Food and Nutrition Educator Guide*. BiblioGov. ISBN: 9781288291038.

VAC- INTERPERSONAL COMMUNICATION

L-1/T/P/C-1

Course Outcomes

- Develop effective verbal and non-verbal communication skills.
- Improve interpersonal relationships in professional settings.
- Enhance confidence and teamwork abilities.

Program Outcomes

- Communicate effectively with patients and healthcare professionals.
- Promote teamwork and professional ethics.
- Improve workplace interaction and patient care.

Learning Objectives

- To study principles of interpersonal communication.
- To understand communication barriers and strategies.
- To develop listening, speaking, and presentation skills.

Learning Outcomes

- Demonstrate effective interpersonal communication skills.
- Apply professional communication techniques in healthcare settings.
- Build positive relationships through effective interaction.

SYLLABUS

UNIT I: Introduction to Interpersonal and Verbal Communication

3 Hours

Introduction to Interpersonal Communication

- Overview of interpersonal communication theory

- Key principles of communication
 - Sender
 - Message
 - Receiver
 - Feedback
 - Noise
- Importance of communication in daily and professional life

Verbal Communication

- Role of language in communication
- Choosing words effectively
 - Clarity
 - Precision
 - Avoiding ambiguity
- Influence of culture and context on verbal communication
- Barriers to effective verbal communication

UNIT II: Non-Verbal Communication and Listening Skills

3 Hours

Non-Verbal Communication

- Body language and facial expressions
- Gestures, posture, and personal space
- Touch and physical presence in communication
- Role of non-verbal cues in expressing emotions and attitudes

Listening Skills

- Types of listening
 - Active listening
 - Passive listening
 - Reflective listening
- Barriers to effective listening
- Empathy and understanding through listening
- Improving listening and feedback skills

UNIT III: Self-Disclosure, Relationships, and Conflict Resolution

3 Hours

Self-Disclosure and Relationship Development

- Importance of self-disclosure in relationships
- Johari Window model
- Trust, intimacy, and relationship development
- Communication and emotional connection

Conflict in Interpersonal Communication

- Types of conflict
 - Productive conflict
 - Destructive conflict
- Conflict management styles
- Healthy conflict resolution strategies
- Communication skills for managing disagreements

UNIT IV: Cultural, Gender, and Workplace Communication

3 Hours

Cultural and Gender Differences in Communication

- Cultural influences on communication styles
- Gender differences in communication
- Cross-cultural communication strategies
- Respecting diversity and inclusion in communication

Communication in the Workplace

- Professional interpersonal communication
- Workplace relationships and professional boundaries
- Communication and leadership
- Team communication and collaboration skills

UNIT V: Communication in Relationships and Digital Communication Ethics

3 Hours

Communication in Close Relationships

- Communication in romantic relationships, friendships, and family
- Managing expectations in relationships
- Maintaining healthy and respectful communication

Digital Communication and Ethics

- Role of technology in interpersonal communication
- Impact of social media on relationships
- Advantages and limitations of digital communication
- Ethical issues in communication
 - Honesty and transparency
 - Privacy and confidentiality
 - Respecting personal boundaries online
- Responsible use of digital communication tools

References

- Adler, R. B., Rosenfeld, L. B., & Proctor, R. F. (2018). *Interplay: The Process of Interpersonal Communication*. Oxford University Press.
- DeVito, J. A. (2022). *The Interpersonal Communication Book*. Pearson Education.
- Wood, J. T. (2016). *Interpersonal Communication: Everyday Encounters*. Cengage Learning.
- Trenholm, S., & Jensen, A. (2019). *Interpersonal Communication*. Oxford University Press.
- Gudykunst, W. B. (2004). *Bridging Differences: Effective Intergroup Communication*. Sage Publications.

Sixth Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 601	Social Behaviour Change Communication / Nutrition Health Promotion	3	1	4	30	70	100
BND 602	Sustainable Food Systems	3	1	4	30	70	100
BND 603	Field Practice in Public Health and Nutrition	1	3	4	30	70	100
BND 604	Food Product Development	2	4	6	30	70	100

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

BND 605	Case Study Reviews	-	4	4	30	70	100
VAC	Soft skill development	1	-	1	100	-	100
TOTAL		10	13	23	250	350	600

BND 601 SOCIAL BEHAVIOUR CHANGE COMMUNICATION/ NUTRITION HEALTH PROMOTION

L-3/T/P-1/C-4

Course Outcomes

- Apply principles and strategies of social and behaviour change communication in nutrition and public health programs
- Design and implement nutrition health promotion activities for individuals, families, and communities
- Evaluate the effectiveness of communication interventions in improving nutrition and health behaviours

Program Outcomes

- Demonstrate professional competency in planning and delivering nutrition education and health promotion programs
- Integrate communication skills, counselling techniques, and nutrition knowledge for community health improvement
- Develop culturally sensitive and evidence-based approaches for behaviour change and disease prevention

Learning Objectives

- Understand concepts, principles, and theories related to social and behaviour change communication
- Identify communication methods and media used in nutrition and health promotion
- Develop skills in planning, implementing, and evaluating health communication programs

Learning Outcomes

- Explain the role of communication in promoting healthy dietary and lifestyle behaviours
- Prepare and use nutrition education and IEC materials effectively for different target groups
- Assess behavioural and social determinants affecting nutrition and health practices in communities

SYLLABUS

Unit I: Introduction to Social and Behaviour Change Communication

9 Hours

- Concepts and definitions of communication, health communication, and behaviour change communication
- Scope and importance of SBCC in nutrition and public health
- Principles of nutrition health promotion
- Determinants of health and nutrition behaviour
- Health education, counselling, and health promotion

Unit II: Behaviour Change Theories and Communication Process

9 Hours

- Communication process and elements of communication
- Barriers to effective communication
- Behaviour change theories and models
 - Health Belief Model
 - Social Cognitive Theory
 - Theory of Planned Behaviour
 - Transtheoretical Model
 - Diffusion of Innovation Theory
- Motivation and counselling skills in nutrition communication

Unit III: Communication Methods and Media for Nutrition Promotion

9 Hours

- Interpersonal and group communication
- Community communication approaches
- Mass media and digital media in health promotion
- Information, Education and Communication (IEC) strategies
- Behaviour Change Communication (BCC) campaigns
- Development of nutrition education materials
 - Posters
 - Leaflets
 - Flip charts
 - Audio-visual aids
 - Social media content

Unit IV: Planning and Implementation of Health Promotion Programs

9 Hours

- Planning process in nutrition health promotion
- Community needs assessment
- Audience analysis and segmentation
- Advocacy and social mobilization
- School and community nutrition education programs

- Role of NGOs and government organizations in health promotion
- Implementation strategies for SBCC interventions

Unit V: Monitoring, Evaluation, Ethics, and Recent Trends

9 Hours

- Monitoring and evaluation of communication programs
- Indicators for assessing behaviour change
- Ethical issues in health communication
- Cultural sensitivity in nutrition promotion
- Use of technology and mobile health applications
- Recent trends in nutrition communication and public health campaigns

Practical:

30 Hours

- Preparation of nutrition education materials such as posters, pamphlets, and flip charts
- Conducting individual and group nutrition counselling sessions
- Developing Behaviour Change Communication (BCC) messages for different target groups
- Observation and analysis of health promotion campaigns
- Organizing community nutrition awareness programs
- Preparation and presentation of audio-visual nutrition education tools
- Field visit to community health centres, NGOs, or public health organizations
- Evaluation of existing nutrition and health promotion programs

Reference Books

- Theory at a Glance: A Guide for Health Promotion Practice Glanz, K., & Rimer, B. K. (2005). *Theory at a Glance: A Guide for Health Promotion Practice* (2nd ed.). NIH, National Cancer Institute.
- How Can Stages of Change Be Best Used in Dietary Interventions? Kristal, A. R., Glanz, K., Curry, S. J., & Patterson, R. E. (1999). *How Can Stages of Change Be Best Used in Dietary Interventions?* *Journal of the American Dietetic Association*, 99, 679–684.
- STEPS: A Framework for Surveillance World Health Organization. (2003). *STEPS: A Framework for Surveillance – The WHO STEPwise Approach to Surveillance of Noncommunicable Diseases (STEPS)*. Geneva.
- Social and Behavior Change Communication Training for IEC Officers USAID. (2013). *Social and Behavior Change Communication (SBCC) Training for Information, Education, and Communication (IEC) Officers*.
- Health Behavior and Health Education: Theory, Research, and Practice Sallis, J. F., Owen, N., & Fisher, E. B. (2008). “Ecological Models of Health Behavior.” In Glanz, K., Rimer, B. K., & Viswanath, K. (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (4th ed., pp. 465–485). Jossey-Bass.
- Behavior Change Theories and Strategies in Nutrition Counseling Spahn, J. M., Reeves, R. S., Keim, K. S., Laquatra, I., Kellogg, M., Jortberg, B., & Clark, N. A. (2010). *State of*

the Evidence Regarding Behavior Change Theories and Strategies in Nutrition Counseling to Facilitate Health and Food Behavior Change. Journal of the American Dietetic Association, 110(6), 879–891.

- Hands-on Guide to Questionnaire Research Boynton, P. M., & Greenhalgh, T. (2004). *Hands-on Guide to Questionnaire Research: Selecting, Designing, and Developing Your Questionnaire. BMJ*, 328, 1312–1315.
- Health Promoting Schools: A Framework for Action World Health Organization. (2009). *Health Promoting Schools: A Framework for Action*. Geneva. ISBN: 9789290614470.
- Applying Research and Theory in Program Planning Lytle, L. A., & Perry, C. L. (2001). *Applying Research and Theory in Program Planning: An Example from a Nutrition Education Intervention. Health Promotion Practice*, 2(1), 68–80.
- Healthy Workplaces: A Model for Action World Health Organization. (2010). *Healthy Workplaces: A Model for Action for Employers, Workers, Policy-makers and Practitioners*.
- Introduction to Health Education and Health Promotion Simons-Morton, B. G., Greene, W. H., & Gottlieb, N. H. (1995). "Evaluation." In *Introduction to Health Education and Health Promotion* (2nd ed., pp. 218–241). Waveland Press.
- Field Guide to Designing Communication Strategy World Health Organization. (2007). *Field Guide to Designing Communication Strategy*.
- Designing a Health Communication Strategy Johns Hopkins University – Centre for Communication Programs. *Designing a Health Communication Strategy*.
- Nutrition Toolkit-09: Communication for Behaviour Change in Nutrition Projects Favin, M., & Griffiths, M. (1999). *Nutrition Toolkit-09: Communication for Behaviour Change in Nutrition Projects*. Human Development Network, The World Bank.
- Communicating Health Hubley, J. (1993). *Communicating Health*. Teaching Aids at Low Cost, London, UK.
- Health Education: Theoretical Concepts, Effective Strategies and Core Competencies World Health Organization Regional Office for the Eastern Mediterranean. (2012). *Health Education: Theoretical Concepts, Effective Strategies and Core Competencies: A Foundation Document to Guide Capacity Development of Health Educators*.

BND 602 SUSTAINABLE FOOD SYSTEMS

L-3/T/P-1/C-4

Course Outcomes

- Understand concepts of sustainable food production and consumption.
- Explain the relationship between food systems, nutrition, and the environment.
- Analyze sustainable approaches for food security and health.

Program Outcomes

- Promote sustainable dietary and food practices.
- Support environmental conservation through responsible food choices.
- Encourage sustainable nutrition strategies in communities.

Learning Objectives

- To study principles of sustainable food systems.
- To understand environmental impacts of food production.
- To learn sustainable approaches to nutrition and food security.

Learning Outcomes

- Explain the importance of sustainable food systems.
- Identify environmentally friendly dietary practices.
- Promote sustainable food choices for community health.

SYLLABUS

Unit 1: Food Systems and Food Security

(9 Hours)

- Definition and overview of food systems
 - Food production to consumption
 - Food waste and loss
- Food system development paradigm
- Global and national food systems
- Industrial and local food systems
- Food value chains in India for different food groups
- Nutrition anthropology and context-specific food systems
- Food security concepts
 - Availability
 - Accessibility
 - Affordability
 - Utilization
 - Stability
- Spatial typology and GIS mapping for food vulnerability analysis

Unit 2: Sustainable Diets and Sustainable Development Goals

(9 Hours)

- Concept and importance of sustainable diets
- Food systems approach for achieving Sustainable Development Goals (SDGs)
- Sustainable diets and improvement of diet quality and health
- Role of biodiversity, environment, and climate in sustainable diets
- Equity and fair trade in sustainable food systems
- Eco-friendly, local, and seasonal foods
- Cultural heritage, traditional food practices, and food anthropology
- Relationship between nutrition, environment, and sustainability

Unit 3: Healthy Diets and Dietary Diversity Assessment

(9 Hours)

- Concept of healthy diets and balanced nutrition
- Understanding dietary diversity
- Household Dietary Diversity Score (HDDS)
- Women's Dietary Diversity Score (WDDS)
- Minimum Acceptable Diet (MAD)
- Minimum Dietary Diversity (MDD)
- Guidelines and tools for measuring dietary diversity
- Role of dietary diversity in improving nutrition outcomes

Unit 4: Nutrition-Sensitive and Climate-Smart Agriculture

(9 Hours)

- Overview of nutrition-sensitive agriculture
- Role of horticulture in healthy diets
- Promoting fruits, vegetables, and legumes in diets
- Biofortification and innovative technologies for nutritious food production
- Terrace gardening, kitchen gardening, and hydroponics
- Environmentally sound agricultural practices
- Climate-Smart Agriculture (CSA)
 - Principles of CSA
 - Mitigation of greenhouse gas emissions
 - Adaptation to climate change
 - Sustainable agricultural practices
- Achieving the triple benefits of CSA
 - Increased productivity
 - Enhanced resilience
 - Reduced emissions
- Role of governments and global agencies in climate-smart food systems

Unit 5: Food Environments, Livestock, and Sustainable Food Policies

(9 Hours)

- Food environments and consumer food choices
 - Physical factors
 - Economic factors
 - Political factors
 - Socio-cultural factors
- Urban diets and food systems
 - Trends
 - Challenges
 - Opportunities for policy action
- Rural diets and food systems
 - Trends
 - Challenges
 - Opportunities for policy action
- Animal husbandry, livestock, and fisheries for sustainable diets

- Climate-resilient livestock farming approaches
- Relationship between livestock, fisheries, and sustainable food systems
- Trade and taxation policies promoting nutritious and sustainable diets
- Identifying gaps and investment priorities in food systems and nutrition planning

PRACTICAL

(30 Hours)

1. Visit farms, markets and food processing units to prepare food value chains in India for various food groups.
2. Understand local food vulnerability using available GIS maps.
3. Prepare a tool and assess Food security – (availability, accessibility, affordability, utilization and stability)- in urban and rural households- data analysis and interpretation.
4. Assess household and individual dietary diversity Household Dietary diversity score (HDDS) in urban and rural households- data analysis and interpretation.
5. Assess Women's Dietary diversity score - in urban and rural households- data analysis and interpretation (WDDS)
6. Assess Minimum acceptable diets (MAD), Minimum Dietary diversity (MDD) for children - data analysis and interpretation (WDDS)
7. Develop a tool and assess food environment in urban and rural households- data analysis and interpretation.

Text Books

- Sustainable Diets and Biodiversity Burlingame, B., & Dernini, S. (Eds.). (2012). *Sustainable Diets and Biodiversity: Directions and Solutions for Policy, Research and Action*. FAO and Bioversity International.
- Climate Smart Agriculture Lipper, L., McCarthy, N., Zilberman, D., Asfaw, S., & Branca, G. (Eds.). (2018). *Climate Smart Agriculture: Building Resilience to Climate Change*. Springer.
- Indian Food Anthropology and the Eat Right Movement – Volume 1 Nambiar, V. (Ed.). (2021). *Indian Food Anthropology and the Eat Right Movement – Volume 1*. Selective & Scientific Books.

Reference Books

- Guidelines for Measuring Household and Individual Dietary Diversity Kennedy, G., Ballard, T., & Dop, M. C. (2011). *Guidelines for Measuring Household and Individual Dietary Diversity*. FAO, Rome.
- Nutrition and Food Systems HLPE. (2017). *Nutrition and Food Systems*. High Level Panel of Experts on Food Security and Nutrition.

Webliography

- [Food and Agriculture Organization \(FAO\)](#)
- [World Health Organization – Nutrition](#)
- [Food Safety and Standards Authority of India \(FSSAI\)](#)

BND 603 FIELD PRACTICE IN PUBLIC HEALTH AND NUTRITION

L-1/T/P-3/C-4

Course Outcomes

- Understand practical aspects of community nutrition and public health.
- Apply nutrition knowledge in field and community settings.
- Develop skills in nutritional assessment and health education.

Program Outcomes

- Participate effectively in community nutrition programs.
- Promote public health awareness and disease prevention.
- Apply practical skills in nutrition intervention activities.

Learning Objectives

- To study field-based public health nutrition practices.
- To understand community assessment and survey methods.
- To learn health education and awareness strategies.

Learning Outcomes

- Conduct community nutrition assessments effectively.
- Organize nutrition education and awareness activities.
- Apply public health nutrition principles in real-life settings.

SYLLABUS

Unit 1: Nutrition and Health Program Planning at Sub-National Level

(3 Hours)

- Understanding sub-national level nutrition and health situations
- Use of available data sets for local, district, and regional assessment
- Nutrition and health delivery systems for Essential Nutrition Actions (ENA)
- Decentralization and governance in nutrition programs
- Concept, need, and importance of strategic planning at sub-national level
- Community participation and stakeholder involvement
- Bottom-up and inter-sectoral approaches in health planning
- Leadership, management, and partnership for district health
- Issues in planning
 - Social determinants
 - Socio-cultural context
 - Scale-up and sustainability

Unit 2: Results-Based Model for Nutrition Program Management

(3 Hours)

- Introduction to Results-Based Management (RBM)
- Basic concepts, principles, and best practices of RBM
- RBM as a strategy implementation and management tool
- Logical framework approach in nutrition program management
- Link between resources and results
 - Inputs
 - Activities
 - Outputs
 - Outcomes
 - Impact
- Application of RBM in nutrition and health programs

Unit 3: Scaling Up and Sustainability of Nutrition Programs

(3 Hours)

- Concept and importance of program sustainability
- Assessment of sustainability in nutrition and health programs
- Sustainability Action Plan
 - Tools
 - Agencies and organizations
 - Resources and timeframe
- Scaling up nutrition and health interventions
- Participatory approaches involving stakeholders
- Tailoring interventions to socio-cultural and institutional settings
- Monitoring implementation processes and surveillance changes

Unit 4: Nutrition and Health Program Design

(3 Hours)

- Collection and synthesis of nutrition and health information
- Setting SMART program goals and objectives
- Review of existing nutrition and health services
- Assessment of service coverage, utilization, and gaps
- Preliminary program design and intervention planning
- Selection of program approaches and delivery strategies
- Replicability and sustainability of interventions
- Role of program frameworks in design and implementation

Unit 5: Monitoring and Evaluation of Nutrition Programs

(3 Hours)

- Importance of monitoring and evaluation in nutrition programs
- Types of monitoring in health and nutrition programs

- ICT-based real-time monitoring systems
- Process evaluation
- Outcome evaluation
- Impact evaluation
- Documentation, reporting, and dissemination of program findings
- Use of evaluation results for program improvement

PRACTICAL

Unit 1: Situational Analysis and Needs Assessment

(18 Hours)

- Concept and importance of situational analysis in planning cycle
- Organizing and conducting situational analysis and need assessment
- Setting priorities based on nutrition and health targets
- Rapid needs assessment and identification of data gaps
- Designing and pretesting survey tools
- Quantitative and qualitative research tools
 - Advantages and challenges
- Structured interviews and data collection methods
- Semi-structured and informal in-depth interviews with key informants

Unit 2: Strategic and Operational Planning

(18 Hours)

- Concepts of strategic and operational planning
- Setting goals and objectives using SMART criteria
- Planning at local and decentralized levels
- Issues in planning at sub-national levels
- Selection of study design and sampling framework
- Determination of sample size
- Steps involved in operational planning
- Stakeholder mapping and participatory program planning
- Triple A approach in health and nutrition programs

Unit 3: Program Implementation, Monitoring, and Evaluation

(18 Hours)

- Execution and implementation of program plans
- Monitoring strategies and supervision techniques
- Identification of output, outcome, and impact indicators
- Risk assessment and management tools
- Identifying threats, issues, and tasks in program implementation
- Reporting progress and performance
- Dissemination of findings and communication with stakeholders

Unit 4: Field Exposure and Community-Based Research

(18 Hours)

- Placement in government, NGO, or donor/bilateral agencies
- Situational analysis of selected nutrition and health programs
- Assessment from management, anthropological, epidemiological, and IEC perspectives
- Critique of existing health and nutrition programs
- Study of inter-sectoral and intra-sectoral linkages in planning and implementation
- Conducting formative research using qualitative and participatory tools
- Assessment of nutrition and health perceptions among service providers and communities

Unit 5: Intervention Planning, Data Analysis, and Reporting

(18 Hours)

- Critique of IEC materials and communication techniques
- Planning, implementation, and evaluation of focused interventions
- Community participation in health and nutrition programs
- Manual and computer-based data analysis
- Preparation and submission of field reports
- Exposure to urban, rural, and tribal health settings
- Presentation and discussion of field experiences and findings

Reference Books

- Strategizing National Health in the 21st Century: A Handbook Schmets, G., Rajan, D., & Kadandale, S. (Eds.). (2016). *Strategizing National Health in the 21st Century: A Handbook*. World Health Organization.
- Handbook on Planning, Monitoring and Evaluating for Development Results United Nations Development Programme. (2009). *Handbook on Planning, Monitoring and Evaluating for Development Results*. UNDP, New York.
- Guidelines for Implementation of ICT-RTM System Ministry of Women and Child Development. (2018). *Guidelines for Implementation of ICT-RTM System: POSHAN Abhiyaan*. Government of India.
- Nutrition Program Design Assistant CORE Group Nutrition Working Group. (2010). *Nutrition Program Design Assistant: A Tool for Program Planners*. Washington, DC.
- Results-Based Management: Logical Framework Approach United Nations Statistical Institute for Asia & the Pacific. (2007). *Results-Based Management: Logical Framework Approach*. SIAP, Japan.

Webliography

- [Results-Based Management \(RBM\)](#)
- [FAO Investment Learning Platform](#)
- [FANTA Project](#)
- [World Health Organization \(WHO\)](#)

BND 604 FOOD PRODUCT DEVELOPMENT

L-2/T/P-4/C-6

Course Outcomes

- Understand principles of food product development.
- Develop skills in formulation and evaluation of food products.
- Apply nutritional concepts in designing healthy food products.

Program Outcomes

- Promote innovation in food and nutrition products.
- Support development of nutritious and acceptable food products.
- Apply food science knowledge in product development.

Learning Objectives

- To study stages of food product development.
- To understand sensory evaluation and quality testing.
- To learn product formulation and packaging techniques.

Learning Outcomes

- Develop basic nutritious food products.
- Evaluate food products using sensory methods.
- Apply food processing and packaging concepts effectively.

Syllabus

Unit 1: Raw Material Selection and Food Processing

(6 Hours)

- Criteria for selection of raw materials for food processing
- Quality characteristics of raw materials
- Methods of food manufacturing
 - Small-scale production
 - Large-scale production
 - Manual processing
 - Automated and computerized processing
- Importance of raw material quality in food product development
- Factors affecting food processing and production

Unit 2: Food Product Development

(6 Hours)

- Principles and stages involved in product development

- Definition, classification, and characterization of food products
- Factors influencing product development
 - Social concerns
 - Health concerns
 - Technological advancements
 - Marketing factors
- Generation and screening of ideas for new food products
- Role of innovation in food product development

Unit 3: Specialized and Processed Food Products

(6 Hours)

- Convenience foods
- Extruded foods
- Health foods
- Nutritional supplements
- Ready-to-Serve (RTS) foods
- Ready-to-Eat (RTE) foods
- Nutritional and commercial importance of processed foods
- Sensory, chemical, and microbiological evaluation of processed foods

Unit 4: Packaging, Labeling, and Food Safety Standards

(6 Hours)

- Definition and principles of food packaging
- Classification of packaging materials and methods
- Conventional and innovative packaging techniques
- Food labeling and labeling regulations
- Recent trends in packaging materials and labeling
- Food Safety and Standards Act (FSSAI), 2006
- HACCP principles for processed and packaged foods

Unit 5: Marketing and Consumer Acceptance of Food Products

(6 Hours)

- Product cost calculation and pricing
- Product specifications and quality standards
- Marketing strategies for food products
- Advertising methods and promotional techniques
- Consumer behavior and food acceptance
- Role of branding and market research in food product success

PRACTICAL

(120 Hours)

1. Cereal and Pulse based foods
2. Ready to Serve (RTS), Fruit juices, Squash, Jams and Preserves
3. Pickles, Ketchup, Sauce

4. Weaning Foods
5. Health Foods and Nutritional Supplements
6. Convenience foods
7. Selection of a product, preparation, standardization and quality cooking
8. Selection of packaging material, labeling, cost calculation and marketing
9. Presentation of report

Text Books

- Food Science Potter, N. M. (2007). *Food Science* (5th ed.). CBS Publishers & Distributors Pvt. Ltd. ISBN: 9788123904726.
- New Food Product Development Fuller, G. W. (2015). *New Food Product Development* (2nd ed.). CRC Press. ISBN: 9780849316739.

Reference Books

- Sensory Evaluation of Foods Lawless, H. T., & Heymann, H. (2010). *Sensory Evaluation of Foods* (2nd ed.). Springer.
- Food Quality and Safety Jaiswal, P. K. (2020). *Food Quality and Safety*. CBS Publishers & Distributors Pvt. Ltd. ISBN: 9788123917757.

Webliography

- [Ministry of Food Processing Industries](#)
- [Food Research Lab – New Product Development](#)

BND 605 CASE STUDY REVIEWS

L/T/P-4/C-4

Course Outcomes

- Understand clinical case analysis and interpretation.
- Apply nutrition knowledge in patient case management.
- Develop critical thinking and problem-solving skills.

Program Outcomes

- Provide evidence-based nutritional care.
- Improve clinical decision-making abilities.
- Enhance professional competency in dietetics practice.

Learning Objectives

- To study methods of clinical case evaluation.
- To understand nutritional assessment and intervention planning.
- To learn interpretation of medical and dietary data.

Learning Outcomes

- Analyze clinical nutrition case studies systematically.
- Prepare appropriate diet plans based on patient conditions.
- Recommend suitable nutrition interventions effectively.

Syllabus

Unit 1: Advanced Clinical Case Studies

(24 Hours)

- Identification and collection of case studies with advanced complications
- Case studies in:
 - Diabetes and cardiac care
 - Renal disorders
 - Pediatric conditions
 - Hepatic disorders
 - Critical care
 - Respiratory disorders
 - Cancer and oncology nutrition
- Clinical interpretation and documentation of case studies

Unit 2: Disease-Specific Scientific Review and Analysis – I

(24 Hours)

- Scientific review of metabolic health and disease
- Nutrition in women's health
- Diabetes management and nutritional care
- Cardiovascular diseases and dietary interventions
- Evidence-based nutrition practices in disease management

Unit 3: Disease-Specific Scientific Review and Analysis – II

(24 Hours)

- Geriatric nutrition and age-related disorders
- Pediatric nutrition and growth-related concerns
- Renal health and medical nutrition therapy
- Analysis of current scientific literature and research findings
- Critical evaluation of evidence-based studies

Unit 4: Case Study Presentation Methods and Clinical Simulations

(24 Hours)

- Standardized protocols for case study presentations
- Methods and formats of case study presentation
- Clinical simulation exercises
- Mock case presentation sessions

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- Group discussions and collaborative learning approaches
- Communication skills in clinical presentations

Unit 5: Literature Review and Research Presentation

(24 Hours)

- Collection and organization of scientific literature
- Meta-analysis and interpretation of literature reviews
- Presentation of research findings and evidence summaries
- Integration of research into clinical nutrition practice
- Development of analytical and presentation skills in clinical dietetics

Reference Books

- Clinical Nutrition Case Studies Billon, W. (2006). *Clinical Nutrition Case Studies* (4th ed.). Wadsworth.
- Dietetic and Nutrition Case Studies Douglas, P. (2016). *Dietetic and Nutrition Case Studies* (1st ed.). Wiley-Blackwell.
- Food and the Nutrition Care Process Mahan, K. L., & Stump, S. E. (2012). *Food and the Nutrition Care Process* (13th ed.). Saunders Elsevier.
- Medical Nutrition Therapy Practice Skipper, A. (2009). *Medical Nutrition Therapy Practice*. Jones & Bartlett Publishers.
- Clinical Nutrition for Surgical Patients Mariah, M., Russell, M. K., & Shikora, S. A. (2008). *Clinical Nutrition for Surgical Patients*. Jones & Bartlett Publishers.
- Manual of Dietetics Practice Thomas, B. (Ed.). (1994). *Manual of Dietetics Practice*. Blackwell Scientific Publications.
- Modern Nutrition in Health and Disease Shils, M. E., Olson, J. A., & Shike, M. (Eds.). (1994). *Modern Nutrition in Health and Disease* (8th ed.). Lea & Febiger.
- Manual of Nutrition Therapeutics Alpers, D., Stenson, W., & Bier, D. (1995). *Manual of Nutrition Therapeutics* (3rd ed.). Little, Brown and Company.

VAC- SOFT SKILLS DEVELOPMENT

L-1/T/P/C-1

Course Outcomes

- Develop communication and interpersonal skills.
- Improve teamwork and leadership qualities.
- Build professional and ethical behavior.

Program Outcomes

- Demonstrate effective communication skills.
- Improve employability and workplace readiness.
- Promote professionalism in healthcare settings.

Learning Objectives

- To improve verbal and written communication.
- To develop leadership and teamwork skills.
- To enhance confidence and personality development.

Learning Outcomes

- Communicate effectively in professional settings.
- Demonstrate leadership and teamwork abilities.
- Apply professional ethics in workplace situations.

SYLLABUS

UNIT I: Introduction to Soft Skills and Communication Skills

3 Hours

Introduction to Soft Skills

- Definition of soft skills and hard skills
- Importance of soft skills in personal and professional life
- Key soft skills
 - Communication
 - Teamwork
 - Adaptability
 - Problem-solving
 - Leadership

Communication Skills

- Communication process
 - Sender
 - Message
 - Receiver
 - Feedback
- Active listening techniques
- Body language and non-verbal communication
- Effective speaking skills
 - Tone
 - Clarity
 - Pacing
- Email and phone communication etiquette

Activities

- Icebreakers
- Group discussions on workplace soft skills
- Role-playing communication scenarios

Assignment

- Self-assessment of soft skills
- Practice active listening and professional email writing

UNIT II: Emotional Intelligence and Teamwork

3 Hours

Emotional Intelligence (EQ)

- Concept and importance of emotional intelligence
- Components of EQ
 - Self-awareness
 - Self-regulation
 - Motivation
 - Empathy
 - Social skills
- Managing emotions and emotional resilience
- Building empathy and interpersonal understanding

Teamwork and Collaboration

- Team roles and group dynamics
- Effective communication within teams
- Building trust and collaboration
- Conflict management in teams
- Problem-solving and brainstorming in groups

Activities

- Emotional intelligence quizzes
- Team exercises and group discussions
- Problem-solving activities

Assignment

- Reflection journal on emotional intelligence practices
- Team project presentation

UNIT III: Conflict Resolution and Interpersonal Skills

3 Hours

Conflict Resolution

- Sources of conflict
 - Miscommunication
 - Differing priorities
- Conflict resolution strategies
 - Negotiation
 - Mediation

- Compromise
- Role of active listening in conflict management
- Managing emotions during conflicts

Interpersonal Skills

- Relationship building and professional behaviour
- Respect, empathy, and cooperation in workplaces
- Developing positive workplace interactions

Activities

- Case studies on workplace conflicts
- Role-playing conflict resolution situations

Assignment

- Reflection on personal or professional conflict and resolution strategies

UNIT IV: Time Management and Leadership Skills

3 Hours

Time Management and Personal Organization

- Importance of time management
- Prioritization techniques
 - Eisenhower Matrix
 - ABCDE Method
- Time management tools
 - Digital calendars
 - To-do lists
 - Pomodoro technique
- SMART goal setting
- Managing procrastination and distractions

Leadership and Influence

- Types of leadership
 - Transformational leadership
 - Transactional leadership
 - Servant leadership
- Qualities of effective leaders
- Building team morale and motivation
- Persuasion and influencing skills

Activities

- Time-blocking exercises
- Goal-setting workshops
- Leadership style assessment

Assignment

- Prepare a personal time management plan
- Reflection on a leader you admire

UNIT V: Public Speaking and Presentation Skills

3 Hours

Public Speaking Skills

- Importance of public speaking in professional life
- Overcoming fear and anxiety in public speaking
- Voice modulation, eye contact, and body language

Presentation Skills

- Structuring presentations
 - Introduction
 - Main content
 - Conclusion
- Use of visual aids
 - PowerPoint presentations
 - Charts and graphics
- Audience engagement through storytelling and interaction
- Professional presentation etiquette

Activities

- Individual and group presentations
- Mock public speaking sessions

Assignment

- Prepare and deliver a presentation on a selected topic

References

- Goleman, D. (2012). *Emotional Intelligence*. Bantam Books.
- Robbins, S. P., & Hunsaker, P. L. (2018). *Training in Interpersonal Skills: Tips for Managing People at Work*. Pearson Education.
- Lucas, S. E. (2020). *The Art of Public Speaking*. McGraw-Hill Education.
- Adair, J. (2009). *Effective Time Management: How to Save Time and Spend It Wisely*. Pan Macmillan.
- Hughes, R. L., Ginnett, R. C., & Curphy, G. J. (2015). *Leadership: Enhancing the Lessons of Experience*. McGraw-Hill Education.

Seventh Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 701	Information Technology in Nutrition and Dietetics	2	2	4	30	70	100
BND 702	Entrepreneurship in Nutrition and Dietetics	3	1	4	30	70	100
BND 703	Nutrition in Critically Ill	2	2	4	30	70	100
BND 704	Management and Administration in Dietetics Services	2	2	4	30	70	100
BND 705	Nutrition in Emergencies	2	-	2	30	70	100
BND 706	Applied Dietetics / Internship Project	-	4	4	100	-	100
TOTAL		10	11	22	250	350	600

BND 701 INFORMATION TECHNOLOGY IN NUTRITION AND DIETETICS

L-2/T/P-2/C-4

Course Outcomes

- Understand the role of information technology in nutrition and dietetics.
- Apply digital tools for nutritional assessment and diet planning.
- Develop skills in data management and online communication.

Program Outcomes

- Use technology effectively in clinical and community nutrition practice.
- Improve efficiency in nutrition documentation and reporting.
- Enhance professional competency through digital applications.

Learning Objectives

- To study computer applications in nutrition and healthcare.
- To understand digital tools used in dietetics practice.
- To learn online communication and data management techniques.

Learning Outcomes

- Use software for dietary calculations and report preparation.

- Demonstrate effective use of digital tools in nutrition practice.
- Apply information technology skills in healthcare settings.

Syllabus

Unit 1: Introduction to Information Technology in Healthcare

(6 Hours)

- Overview of computer systems and networks
- Computer-based application processes in healthcare
- Role of Information and Communication Technology (ICT) in healthcare
- Applications of ICT in health education, research, referral systems, and data management
- Case studies related to ICT applications in healthcare
- Importance of information systems in healthcare institutions
- Impact of information systems on quality of care, economics, and efficiency

Unit 2: eHealth, mHealth, and Telemedicine

(6 Hours)

- Concepts and scope of eHealth and mHealth
- Introduction to telemedicine and telehealth services
- Goals and initiatives of digital healthcare systems
- Benefits of eHealth and telemedicine in healthcare delivery
- Barriers and challenges in implementation of digital health technologies
- Research trends and innovations in healthcare technology

Unit 3: Health Information Systems and Dietetic Practice

(6 Hours)

- Introduction to health information processing methods
- Health Information Management (HIM): theory and practice
- Role of information systems in dietetic practice
- Electronic health records and patient data management
- Technology-assisted dietary assessment systems
 - Interactive Portion Size Assessment System (IPSAS)
 - Self-Completed Recall and Analysis of Nutrition (SCRAN24)
- Electronic diet recall protocols and applications

Unit 4: Digital Tools for Research and Data Collection

(6 Hours)

- Designing electronic questionnaires and surveys
- Use of Google Forms and digital survey tools
- Conducting online surveys and data collection
- Data analysis, reporting, and interpretation of survey results
- Applications of digital tools in nutrition and healthcare research
- Presentation and discussion of research findings

Unit 5: Report Writing, Ethics, and Legal Issues in Health Informatics

(6 Hours)

- Essentials of scientific and technical report writing
- Research ethics in healthcare and nutrition studies
- Plagiarism and methods to avoid it
- Copyright and intellectual property issues
- Ethical use of digital information and patient data
- Professional standards in healthcare informatics and research

PRACTICAL

Unit 1: Computer Applications and MS Office Tools

(12 Hours)

- Introduction to software applications in nutrition and research
- Basic computer applications in healthcare and dietetics
- Training in MS Office tools
 - Microsoft Word
 - Microsoft Excel
 - Microsoft PowerPoint
 - Microsoft Access
- Data organization, tabulation, and presentation techniques
- Preparation of reports and presentations using digital tools

Unit 2: Software for Research and Dietary Analysis

(12 Hours)

- Literature review and bibliography management tools
 - Mendeley
 - TurnItIn
 - EasyBib
 - Purdue OWL
- Nutritional status assessment software
 - WHO Anthro Plus
- Dietary analysis software
 - Nutritionist Pro
 - DietCal
- Applications of software in nutrition research and dietetic practice
- Presentation and interpretation of research results

Unit 3: Nutrition Communication through Digital Media

(12 Hours)

- Role of media in nutrition communication
- Dietetic practice using social media platforms
 - LinkedIn

- YouTube
- Facebook
- Twitter
- Pinterest
- Professional communication and branding through social media
- Ethical considerations in digital nutrition communication

Unit 4: Digital Content Creation in Nutrition and Dietetics

(12 Hours)

- Designing websites and blogs for nutrition education
- Creating infographics and visual nutrition content
- Development of recipe videos and nutrition podcasts
- Writing articles for magazines and newspapers
- Nutrition communication for the general population
- Project-based learning in digital nutrition communication

Unit 5: Research Presentation and Scientific Communication

(12 Hours)

- Research posters: importance and applications
- Characteristics of an effective research poster
- Designing posters with content, tables, and visuals
- Poster templates and presentation techniques
- Scientific communication and dissemination of research findings
- Examples of effective research posters and presentations

Reference Books

- Food & Nutrition Care Process Mahan, L. K. (2014). *Food & Nutrition Care Process* (14th ed.). Cengage Learning.
- Skill with People Giblin, L. (2010). *Skill with People* (Revised ed.). Skill with People.
- A Writer's Reference Hacker, D., & Sommers, N. (2012). *A Writer's Reference* (8th ed.). Bedford/St. Martin's.
- Principles of Communication Nandi, C. (2009). *Principles of Communication*. Reference Press.
- ABC of Behavior Change Theories Michie, S., van Stralen, M. M., & West, R. (2011). *ABC of Behavior Change Theories: An Essential Resource for Researchers and Diet Practitioners*. Silverback Publishing.
- Health Information Management Technology Johns, M. L. (2010). *Health Information Management Technology: An Applied Approach*. Cengage Learning.
- Microsoft Excel, Microsoft PowerPoint, and Microsoft Access.
- Nutritionist Pro Nutritionist Pro. (n.d.). *DietCal: Tutorials and Demonstrations*.

BND 702 ENTREPRENEURSHIP IN NUTRITION AND DIETETICS

Course Outcomes

- Understand principles of entrepreneurship in nutrition and dietetics.
- Develop business and management skills for nutrition practice.
- Analyze opportunities in nutrition-related enterprises.

Program Outcomes

- Promote self-employment and innovation in nutrition services.
- Apply entrepreneurial skills in healthcare and food industries.
- Enhance leadership and business management abilities.

Learning Objectives

- To study basics of entrepreneurship and business planning.
- To understand marketing and financial management concepts.
- To learn professional ethics and business communication skills.

Learning Outcomes

- Prepare basic business plans related to nutrition services.
- Identify entrepreneurial opportunities in dietetics and wellness sectors.
- Demonstrate management and leadership skills effectively.

SYLLABUS

Unit 1: Introduction to Entrepreneurship in Nutrition and Dietetics

(9 Hours)

- Definition and concepts of entrepreneurship and business
- Evolution of entrepreneurship in the modern economy
- Entrepreneurial attributes, traits, and skills for success
- Understanding target markets in food service, dietetics, and public health
- Identification of viable business opportunities in nutrition and dietetics
- Scope of entrepreneurship in wellness and healthcare sectors

Unit 2: Types and Skills of Entrepreneurship

(9 Hours)

- Types of entrepreneurship
 - Small business entrepreneurs
 - Large company entrepreneurs
 - Scalable startup entrepreneurs
 - Researcher entrepreneurs
 - Hustler entrepreneurs

- Innovative entrepreneurs
 - Social entrepreneurs
 - Trading, marketing, and manufacturing entrepreneurs
 - Lifestyle entrepreneurs
 - Intrapreneurs
- Essential entrepreneurial skills
 - Budgeting
 - Communication
 - Time management
 - Problem solving
 - Creative thinking
 - Leadership and management
 - Decision making
 - Networking and collaboration
 - Public speaking
- Barriers to entrepreneurship
- Traits of successful entrepreneurs in nutrition and dietetics

Unit 3: Marketing and Customer Identification

(9 Hours)

- Customer identification and market analysis
- Environmental scanning
- Competitive assessment
- Marketing strategies and the 3 Cs of marketing
 - Company
 - Customers
 - Competitors
- Components of a successful marketing plan
- Marketing strategies in nutrition and dietetics businesses
- SWOT analysis of brands and businesses

Unit 4: Dietitians as Entrepreneurs and Professional Practice

(9 Hours)

- Role of dietitians as entrepreneurs
- Establishing professional practice and brand identity
- Practice roles in wellness and healthcare settings
- Managing challenges through holistic approaches
- Handling nutritional non-compliance
- Skills and competencies for wellness settings
- Food industry formulations and regulations
- Professional ethics and standards of practice
- Registration, documentation, patents, and intellectual property rights
- University technology transfer, compliances, and approvals

Unit 5: Business Planning and Entrepreneurship Development

(9 Hours)

- Formulation of business plans
 - Meaning, contents, and significance
 - Common errors in business plan formulation
 - Network analysis
- Generating and validating business ideas
- Feasibility analysis and market potential assessment
- Initial sales, profit estimation, and growth opportunities
- Examples of successful startups in nutrition and dietetics
- Entrepreneurship Development Programmes (EDPs)
- Funding opportunities for startups: government and private sectors
- Incentives and subsidies for women entrepreneurs
- National Innovation and Start-up Policy for Students and Faculty

PRACTICAL

Unit 1: Fundamentals of Entrepreneurship in Nutrition and Dietetics

(6 Hours)

- Definition and concepts of entrepreneurship and business
- Evolution of entrepreneurship in the modern economy
- Entrepreneurial attributes, traits, and skills for success
- Scope of entrepreneurship in wellness, healthcare, food service, and dietetics
- Understanding target markets in nutrition and public health
- Identification of viable business opportunities in nutrition and dietetics

Unit 2: Types of Entrepreneurship and Entrepreneurial Skills

(6 Hours)

- Types of entrepreneurship
 - Small business entrepreneurs
 - Large company entrepreneurs
 - Scalable startup entrepreneurs
 - Researcher entrepreneurs
 - Hustler entrepreneurs
 - Innovative entrepreneurs
 - Social entrepreneurs
 - Trading, marketing, and manufacturing entrepreneurs
 - Lifestyle entrepreneurs
 - Intrapreneurs
- Essential entrepreneurial skills
 - Budgeting
 - Communication
 - Time management
 - Problem solving

- Creative thinking
- Leadership and management
- Decision making
- Networking and collaboration
- Public speaking
- Barriers to entrepreneurship
- Traits of successful entrepreneurs in nutrition and dietetics

Unit 3: Marketing, Customer Identification, and Business Strategies

(6 Hours)

- Customer identification and market analysis
- Environmental scanning
- Competitive assessment
- Marketing strategies and the 3 Cs of marketing
 - Company
 - Customers
 - Competitors
- Components of a successful marketing plan
- Marketing strategies in nutrition and dietetics businesses
- SWOT analysis of brands and businesses
- Examples of successful nutrition and dietetics business models

Unit 4: Dietitians as Entrepreneurs and Professional Practice

(6 Hours)

- Role of dietitians as entrepreneurs
- Establishing professional practice and brand identity
- Practice roles in wellness and healthcare settings
- Managing challenges through holistic approaches
- Handling nutritional non-compliance
- Skills and competencies required in wellness settings
- Food industry formulations and regulations
- Professional ethics and standards of practice
- Registration, documentation, patents, and intellectual property rights
- University technology transfer, compliances, and approvals

Unit 5: Business Planning and Entrepreneurship Development

(6 Hours)

- Formulation of business plans
 - Meaning, contents, and significance
 - Common errors in business plan formulation
 - Network analysis
- Generating and validating business ideas
- Feasibility analysis and market potential assessment

- Initial sales, profit estimation, and future growth opportunities
- Entrepreneurship Development Programmes (EDPs)
- Funding opportunities for startups: government and private sectors
- Incentives and subsidies for women entrepreneurs
- National Innovation and Start-up Policy for Students and Faculty
- Examples of successful startups in food service, nutrition, and dietetics

Reference Books

1. Chowdhry Ajay. Just Aspire: Notes on Technology, Entrepreneurship and the Future. Harper Collins India. 2023.
2. HBR's 10 Must Reads on Startups and Entrepreneurship (Featuring Bonus Article "Why the Lean Startup Changes Everything" by Steve Blank). Harvard Business Review Press. 2018.
3. Vishal Gupta. Research Handbook on strategic Entrepreneurship. Edward Elgar Publishing Ltd. 2023.
4. KP Sudheer and Sangeetha K Prathap. Introduction to Entrepreneurship Development in Food Processing. CRC Press. 2021.

BND 703 NUTRITION IN CRITICALLY ILL

L-2/T/P-2/C-4

Course Outcomes

- Understand nutritional requirements of critically ill patients.
- Explain enteral and parenteral nutrition support methods.
- Apply medical nutrition therapy in intensive care settings.

Program Outcomes

- Provide nutritional care for critically ill patients.
- Support recovery and improved clinical outcomes through nutrition therapy.
- Apply evidence-based nutrition interventions in critical care.

Learning Objectives

- To study metabolic changes during critical illness.
- To understand nutritional assessment in ICU patients.
- To learn methods of specialized nutrition support.

Learning Outcomes

- Assess nutritional needs of critically ill patients.
- Plan appropriate enteral and parenteral nutrition support.
- Apply nutrition care principles in intensive care management.

Syllabus

Unit 1: Introduction to Nutrition Support in Critical Care

(6 Hours)

- Concept and importance of nutrition support practice
- Challenges and opportunities in nutrition support
- Role of nutrition therapy in critical illness
- Impact of nutrition therapy on clinical outcomes
- Goals of nutrition support in critically ill patients
- Multidisciplinary approach in critical care nutrition

Unit 2: Nutritional Assessment and Requirements in ICU

(6 Hours)

- Early indicators of malnutrition in ICU patients
- Assessment of nutritional status in critically ill patients
- Energy requirements in critical illness
- Protein requirements in critically ill patients
- Body composition changes during critical illness
- Monitoring nutritional adequacy in ICU patients

Unit 3: Complications and Specialized Approaches in Nutrition Support

(6 Hours)

- Complications of nutrition support
 - Refeeding syndrome
 - Overfeeding
 - Hyperglycemia
- Prevention and management of nutrition-related complications
- Enhanced Recovery After Surgery (ERAS)
- Role of nutrition in recovery and rehabilitation

Unit 4: Nutrition Support in Burn, Trauma, and Critical Illness

(6 Hours)

- Metabolic response to burn and trauma
- Nutrition support in burn patients
- Nutrition support in trauma patients
- Nutrition support in critically ill patients
- Absorption, metabolism, and utilization of macro and micronutrients
- Criteria for implementation of nutrition support
- Principles of nutrition prescription
 - Route of feeding
 - Amount of feeding

Unit 5: Nutrition Formulations and Post-ICU Management

(6 Hours)

- Composition of nutrition support formulas for critically ill patients
- Enteral and parenteral nutrition formulations

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- Micronutrient supplementation in critical care
- Monitoring tolerance and effectiveness of nutrition support
- Post-ICU nutritional management and rehabilitation
- Long-term recovery and follow-up care for critically ill patients

PRACTICAL

(60 Hours)

1. Enteral nutrition formulations
2. Enteral nutrition formulations
3. Nutrition Screening
4. Case studies in Burn patients. for nutritional planning.
5. Case studies in Trauma patients. for nutritional planning.
6. Case studies in Critically ill patients. for nutritional planning.

Text Book and References

- Hall, Schmidt and Wood's Principles of Critical Care Al-Dorzi, H. M., & Arabi, Y. M. (2023). "Nutrition for Critically Ill Patients." In Schmidt, G. A., Kress, J. P., & Douglas, I. S. (Eds.), *Hall, Schmidt and Wood's Principles of Critical Care* (5th ed.). McGraw Hill.
- Practice Guidelines for Nutrition in Critically Ill Patients Mehta, Y., Sunavala, J. D., Zirpe, K., Tyagi, N., Garg, S., Sinha, S., et al. (2018). *Practice Guidelines for Nutrition in Critically Ill Patients: A Relook for Indian Scenario. Indian Journal of Critical Care Medicine*, 22(4), 263–273. DOI: 10.4103/ijccm.IJCCM_3_18.
- Predictive Equations for Energy Needs for the Critically Ill Walker, R. N., & Heuberger, R. A. (2009). *Predictive Equations for Energy Needs for the Critically Ill. Respiratory Care*, 54(4), 509–521.

BND 704 MANAGEMENT AND ADMINISTRATION IN DIETETICS SERVICES

L-2/T/P-2/C-4

Course Outcomes

- Understand principles of management in dietetic services.
- Develop skills in planning and organizing food service systems.
- Apply administrative techniques in healthcare nutrition services.

Program Outcomes

- Manage dietetic and food service departments effectively.
- Promote quality and efficiency in nutrition service management.
- Enhance leadership and organizational skills.

Learning Objectives

- To study management principles and organizational structures.

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- To understand food service administration and quality control.
- To learn budgeting, staffing, and supervision methods.

Learning Outcomes

- Organize and manage dietetic service operations effectively.
- Apply quality control measures in food service systems.
- Demonstrate leadership and administrative skills in healthcare settings.

SYLLABUS

Unit 1: Principles of Hospital Food Service Management

(6 Hours)

- Introduction to hospital food service management
- Principles and techniques of effective management
- Leadership qualities and managerial abilities
- Functions of food service management
- Organizational structure of hospital food service department
- Organizational chart of the food service team in hospitals

Unit 2: Human Resource Management in Food Service

(6 Hours)

- Recruitment and selection of employees
- Induction and orientation programs
- Employee training and development
- Performance appraisal methods
- Leadership and communication in food service management
- Employee welfare and benefits
- Laws governing food service establishments

Unit 3: Physical Facilities, Kitchen Layout, and Equipment

(6 Hours)

- Size and types of hospital kitchens
- Principles of kitchen design and layout
- Ventilation and lighting in food service areas
- Flooring, wall coverings, and maintenance
- Storage areas and storage requirements
- Kitchen equipment and their uses
- Sample layout of a hospital kitchen

Unit 4: Food Materials and Production Management

(6 Hours)

- Purchasing procedures for food materials

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- Receiving and inspection of raw materials
- Storage methods and inventory management
- Importance of proper receiving practices
- Menu planning for hospital patients
- Food production process in hospitals
- Methods of holding foods for service

Unit 5: Sanitation, Hygiene, and Food Safety

(6 Hours)

- Environmental hygiene and sanitation
- Food safety principles in hospitals
- Safe food handling practices
- Personal hygiene of food handlers
- Prevention of food contamination
- Waste disposal and pest control
- Maintaining quality and safety standards in hospital food service

PRACTICAL

(60 Hours)

1. Analyse on-site and off-site catering management in a Hospital
2. Classify the patients in a hospital as per their dietary requirements
3. Analyse different types of food production procedures in hospitals
4. Give a brief outline of an organizational chart for a food service team in hospitals.
5. Describe the important types of commercial food production equipment.
6. Plan and prepare type of menu is generally followed in schools and hospitals

Text Book and References

1. Drummond, Karen E. and Lisa M. Brefere. 2013. Nutrition for Foodservice and Culinary Professionals. New Jersey: Wiley.
2. Sethi, Mohini and Surjeet Malhan. 2018. Catering Management: An Integrated Approach. New Delhi: New Age International Private Limited.
3. Puckett, Ruby Parker. 2012. Foodservice Manual for Health Care Institutions. San Francisco: Jossey Bass Publishers.

BND 705 NUTRITION IN EMERGENCIES

L-2/T/P-1/C-3

Course Outcomes

- Understand nutritional challenges during emergencies and disasters.
- Explain emergency feeding and relief nutrition programs.
- Apply nutrition strategies for vulnerable populations during crises.

Program Outcomes

- Support emergency nutrition and disaster management programs.
- Promote food security and nutritional care during emergencies.

- Apply public health nutrition principles in crisis situations.

Learning Objectives

- To study nutrition-related issues during disasters and emergencies.
- To understand emergency feeding programs and interventions.
- To learn management of malnutrition in emergency conditions.

Learning Outcomes

- Identify nutritional risks during emergencies.
- Plan basic nutrition interventions for disaster-affected populations.
- Apply emergency nutrition management principles effectively.

Syllabus

Unit 1: Introduction to Nutrition in Emergencies

(6 Hours)

- Definition and types of emergencies
 - Natural disasters
 - Conflicts and wars
 - Pandemics and epidemics
- Impact of emergencies on food security and nutritional status
- Causes and consequences of malnutrition during emergencies
- Vulnerable groups in emergency situations
- Role of nutrition in disaster response and recovery

Unit 2: Nutritional Assessment and Requirements in Emergencies

(6 Hours)

- Rapid nutrition assessments and surveys
- Indicators of nutritional status
 - Anthropometric assessment
 - Biochemical assessment
 - Clinical assessment
 - Dietary assessment
- Nutritional requirements of emergency-affected populations
- Identification of high-risk groups
- Monitoring and evaluation of nutrition status during emergencies

Unit 3: Emergency Nutrition Programs and Interventions

(6 Hours)

- Types of nutrition interventions
 - General food distribution
 - Supplementary feeding programs

- Therapeutic feeding programs
- Micronutrient interventions and prevention of deficiencies
- Mobilization and distribution of resources
 - Local resources
 - General funds
 - Social funds
- Planning and implementation of emergency nutrition programs

Unit 4: Management of Malnutrition in Emergencies

(6 Hours)

- Classification of acute malnutrition
 - Severe Acute Malnutrition (SAM)
 - Moderate Acute Malnutrition (MAM)
- Community-based Management of Acute Malnutrition (CMAM)
- Role of Ready-to-Use Therapeutic Foods (RUTF)
- Supplementary foods in rehabilitation
- Prevention and control of malnutrition during emergencies

Unit 5: Food Security, WASH, and Humanitarian Coordination

(6 Hours)

- Strategies for food security and livelihood support
- Importance of Water, Sanitation, and Hygiene (WASH) in nutrition
- Coordination with humanitarian organizations and relief agencies
- Overview of international guidelines
 - Sphere standards
 - World Health Organization (WHO) guidelines
 - UNICEF guidelines
- Ethical considerations and cultural sensitivity in emergency nutrition
- Long-term rehabilitation and sustainable recovery strategies

PRACTICAL

(30 Hours)

1. Techniques of nutritional assessment.
2. Conducting a mock rapid nutrition assessment using assessment tools and data collection techniques
3. Practice in anthropometric measurements (weight, height, MUAC)
4. Calculating and interpreting nutritional indicators (BMI, z-scores)
5. Developing a plan for a general food distribution program
6. Planning supplementary and therapeutic feeding programs
7. Analyzing case studies of past emergencies
8. Discussing challenges and solutions in implementing nutrition programs
9. Role-playing scenarios in emergency response coordination
10. Communication strategies with affected populations and stakeholders
11. Creating culturally appropriate nutrition education materials for emergencies
12. Designing public awareness campaigns on nutrition and hygiene

Reference Books

- Emergency Nutrition: Principles and Practice in Humanitarian Response Watson, F., & Sandoz, Y. (Eds.). (2020). *Emergency Nutrition: Principles and Practice in Humanitarian Response*. Oxford University Press.
- Nutrition in Emergencies Wilkinson, C., & Whitehead, C. (2019). *Nutrition in Emergencies*. CABI Publishing.
- The Sphere Handbook The Sphere Project. (2018). *The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response* (4th ed.). Practical Action Publishing.
- Management of Severe Acute Malnutrition in Children World Health Organization. (2013). *Management of Severe Acute Malnutrition in Children: Working Towards Results at Scale*. WHO.
- Food and Nutrition in Emergencies World Food Programme & United Nations Children's Fund. (2017). *Food and Nutrition in Emergencies: An Approach to Effective Interventions*. WFP & UNICEF.

Webliography

- [WHO – Nutrition in Emergencies](#)
- [UNICEF – Nutrition Emergencies](#)
- [Sphere Standards](#)
- [Nutrition Cluster](#)
- [World Food Programme – Emergencies](#)

BND 706 APPLIED DIETETICS/ INTERNSHIP PROJECT

L/T/P-4/C-4

Course Outcomes

- Apply theoretical knowledge of clinical nutrition and dietetics in hospital and community settings
- Demonstrate professional skills in nutritional assessment, diet planning, counselling, and patient care
- Prepare and present internship reports, case studies, and project findings using scientific and ethical approaches

Program Outcomes

- Develop competency in evidence-based dietetic practice and nutrition care management
- Demonstrate communication, teamwork, leadership, and ethical responsibilities in professional healthcare settings
- Integrate research, critical thinking, and problem-solving skills in clinical and community nutrition practice

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

Learning Objectives

- Understand practical applications of nutrition and dietetics in clinical, community, and food service settings
- Develop skills in patient assessment, therapeutic diet planning, and nutrition counselling
- Gain exposure to professional healthcare systems, interdisciplinary teamwork, and nutrition research practices

Learning Outcomes

- Perform nutritional assessment and provide appropriate dietary interventions for various disease conditions
- Communicate effectively with patients, healthcare professionals, and community groups regarding nutrition care
- Analyze and document internship experiences, clinical cases, and project work in a systematic and professional manner.

Eighth Semester

Course Code	Course Title	Theory Credits	Practical Credits	Total Credits	MAX MARKS		Total
					INT	EXT	
BND 801	Internship in Hospital / Experiential Learning	-	14	14	100	-	100
BND 802	Research and Trends in Nutrition and Dietetics	-	4	4	30	70	100
BND 803	Scientific Writing in Nutrition and Dietetics	-	4	4	30	70	100
TOTAL		-	22	22	160	140	300

BND 801 INTERNSHIP IN HOSPITAL- 3 MONTHS

L/T/P-14/C-14
(210 Hours)

Course Outcomes

- Integrate theoretical knowledge with practical dietetics experience.
- Develop professional skills in clinical and community nutrition practice.
- Apply nutritional assessment and diet planning in real-life settings.

Program Outcomes

- Demonstrate competency in professional dietetics practice.

BACHELOR OF SCIENCE IN NUTRITION AND DIETETICS

- Apply evidence-based nutrition care in healthcare settings.
- Enhance practical, communication, and problem-solving skills.

Learning Objectives

- To gain practical exposure in clinical and community nutrition.
- To understand professional responsibilities in dietetics practice.
- To learn patient assessment, counseling, and diet planning techniques.

Learning Outcomes

- Perform nutritional assessment and counseling effectively.
- Prepare therapeutic diet plans for patients.
- Demonstrate professional ethics and practical dietetics skills.

OR

BND 801 EXPERIMENTAL LEARNING PROGRAMME (3 MONTHS)

**L/T/P-14/C-14
(210 Hours)**

Course Outcomes

- Understand practical applications of nutrition and dietetics concepts in real-life settings.
- Develop professional skills through hands-on training and field exposure.
- Apply theoretical knowledge in clinical, community, and food service environments.

Program Outcomes

- Demonstrate competency in professional nutrition and dietetics practice.
- Enhance problem-solving, communication, and teamwork skills.
- Promote ethical and evidence-based nutrition care in practical settings.

Learning Objectives

- To provide practical exposure in clinical and community nutrition.
- To develop skills in nutritional assessment, counseling, and diet planning.
- To understand workplace ethics, responsibilities, and professional conduct.

Learning Outcomes

- Perform nutritional assessment and dietary planning effectively.
- Demonstrate professional communication and teamwork skills.
- Apply nutrition and dietetics knowledge confidently in healthcare and community settings.

BND 802 RESEARCH AND TRENDS IN NUTRITION AND DIETETICS

Course Outcomes

- Apply research methodologies and evidence-based approaches in nutrition and dietetics practice
- Analyze emerging trends, innovations, and scientific advancements in nutrition and healthcare
- Interpret and communicate research findings effectively for clinical, community, and academic applications

Program Outcomes

- Develop competency in conducting and evaluating nutrition and dietetics research ethically and scientifically
- Integrate current research evidence and emerging technologies into professional nutrition practice
- Demonstrate critical thinking, problem-solving, and lifelong learning skills in the field of nutrition and dietetics

Learning Objectives

- Understand principles of research methodology and evidence-based nutrition practice
- Identify recent advances and emerging trends in nutrition, dietetics, and public health
- Develop skills in reviewing, analyzing, and presenting scientific research findings

Learning Outcomes

- Explain different research approaches and their applications in nutrition and dietetics
- Critically evaluate scientific literature and emerging nutrition trends using evidence-based methods
- Prepare and communicate research reports, presentations, and nutrition-related recommendations effectively

SYLLABUS

Unit I: Research Process and Responsible Conduct

24 Hours

- Introduction to research in nutrition and dietetics
- Principles of research design and methodology
- Steps in the research process
- Basics of research analysis and interpretation
- Ethical considerations in research studies
- Concept, causes, and consequences of plagiarism
- Methods and tools to prevent plagiarism
- Identification of complex nutrition-related issues

Unit II: Study Designs in Nutrition Research

24 Hours

- Introduction to study designs in nutrition research
- Observational study designs
 - Cross-sectional studies
 - Case-control studies
 - Cohort studies
- Experimental study designs
 - Randomized controlled trials
 - Clinical trials
- Quasi-experimental studies
- Applications of different study designs in nutrition and public health

Unit III: Evaluating Evidence and Research Findings

24 Hours

- Strengths and limitations of different research designs
- Quality evaluation of research studies
- Critical appraisal of scientific literature
- Reviewing literature on nutrition-related topics
- Data analysis and interpretation of research findings
- Evidence-based nutrition practice

Unit IV: Information Literacy and Scientific Evidence

24 Hours

- Literacy skills for scientific research
- Use of reliable databases, journals, and scientific sources
- Searching scientific literature effectively
- Referencing and citation methods
- Evaluation of credibility and reliability of information sources
- Use of digital tools and software for literature management

Unit V: Knowledge Translation and Communication

24 Hours

- Principles of knowledge translation in nutrition and health
- Communication of research findings to different audiences
- Scientific presentation and report writing
- Group discussions on nutrition-related issues
- Peer learning and collaborative approaches
- Role of research communication in public health nutrition and policy making

Reference Books

- Nutrition Research MethodologiesVegrove, J. A., Hodson, L., Sharma, S., & Lanham-New, S. A. (2015). *Nutrition Research Methodologies (The Nutrition Society Textbook)*. Wiley-Blackwell.
- Trends in Nutrition ResearchStarks, T. P. (2006). *Trends in Nutrition Research*. Nova Science Publishers Inc.
- Analysis in Nutrition ResearchPounis, G. (2018). *Analysis in Nutrition Research: Principles of Statistical Methodology and Interpretation of the Results*. Academic Press Inc.
- Statistics in Nutrition and DieteticsNelson, M. (2020). *Statistics in Nutrition and Dietetics*. Wiley-Blackwell.
- Research Methods for Anthropological Studies of Food and Nutrition Chrzan, J., & Brett, J. (2017). *Research Methods for Anthropological Studies of Food and Nutrition*. Berghahn Books.
- Research Ethics and PlagiarismSreelathak, N. T., & Sreelatha, K. (2021). *Research Ethics and Plagiarism*. EssEss Publications.

BND 803 SCIENTIFIC WRITING IN NUTRITION AND DIETETICS

L/T/P-2/C-2

Course Outcomes

- Apply principles of scientific writing to prepare clear and structured scientific documents in nutrition and dietetics
- Critically evaluate research studies and interpret scientific evidence effectively
- Demonstrate presentation and communication skills for scientific and professional forums

Program Outcomes

- Develop competency in scientific communication, research interpretation, and evidence-based practice
- Demonstrate ethical and professional standards in scientific writing and research dissemination
- Integrate analytical, critical thinking, and communication skills for academic and professional growth in nutrition and dietetics

Learning Objectives

- Understand the structure, style, and principles of scientific writing in nutrition and health sciences
- Develop skills in evaluating research studies and scientific literature critically
- Gain proficiency in presenting and communicating research findings through written and oral formats

Learning Outcomes

- Prepare scientific manuscripts including abstracts, introductions, methods, results, and discussions effectively
- Critically analyze research articles based on study design, methodology, and data interpretation
- Deliver scientific presentations and communicate research findings confidently to professional audiences

SYLLABUS

Unit I: Introduction to Scientific Writing

12 Hours

- Overview of scientific writing in nutrition and dietetics
- Importance of clear and effective communication in science
- Characteristics of scientific writing
- Types of scientific writing
 - Research articles
 - Review articles
 - Case reports
 - Technical reports
- Ethics in scientific writing and publication

Unit II: Research Study Evaluation

12 Hours

- Components of a research study
 - Background
 - Objectives
 - Methodology
 - Results
 - Conclusions
- Critical evaluation of research studies
- Assessment of study design and methodology
- Population selection and sampling techniques
- Evaluation of data collection and data analysis methods
- Interpretation of scientific evidence

Unit III: Writing a Scientific Manuscript

12 Hours

- Writing the abstract and introduction
 - Background information
 - Research questions and objectives

- Methodology section
 - Study design
 - Participant recruitment
 - Data collection procedures
- Writing results and discussion sections
- Interpretation and implications of findings
- Writing conclusions and recommendations

Unit IV: Data Presentation and Editing Techniques

12 Hours

- Preparation of effective tables, graphs, and figures
- Referencing and citation styles in scientific writing
- Use of reference management software
- Strategies for editing scientific documents
 - Grammar and syntax
 - Clarity and conciseness
 - Logical flow and organization
- Avoiding plagiarism in scientific writing

Unit V: Scientific Presentation and Research Communication

12 Hours

- Principles of scientific communication
- Synthesis and interpretation of research findings
- Communication of research results to professional audiences
- Oral presentation skills
- Poster presentation techniques
- Use of audiovisual aids and digital tools in presentations
- Professional conduct during scientific forums and conferences

Reference Books

- The Scientist's Guide to Writing Heard, S. B. (2016). *The Scientist's Guide to Writing: How to Write More Easily and Effectively throughout Your Scientific Career*. Princeton University Press.
- Scientific Writing and Publishing Wheatley, D. (2021). *Scientific Writing and Publishing*. Cambridge University Press.
- Scientific Writing and Research Quality Prasann, K., & Bharti, P. K. (2020). *Scientific Writing and Research Quality*. Discovery Publishing House.
- Analysis in Nutrition Research Pounis, G. (2018). *Analysis in Nutrition Research: Principles of Statistical Methodology and Interpretation of the Results*. Academic Press Inc.
- Statistics in Nutrition and Dietetics Nelson, M. (2020). *Statistics in Nutrition and Dietetics*. Wiley-Blackwell.

- Research Ethics and Plagiarism Sreelathak, N. T., & Sreelatha, K. (2021). *Research Ethics and Plagiarism*. EssEss Publications.