NATIONAL CURRICULUM AND CREDIT FRAMEWORK (NCCF)

SYLLABUS

For

Under Graduate Course

In

NUTRITION

w.e.f. Academic Session 2023-24

KAZI NAZRUL UNIVERSITY

Asansol, Paschim Barddhaman

West Bengal-713340

SEMESTER: I

MAJOR COURSE-I

COURSE NAME: FUNDAMENTALS OF NUTRITION SCIENCE-I

COURSE CODE: BSCNUTMJ101

Course Type: Major (Theoretical)	Course Details: MJC-1			L-T-P: 4 - 1 - 0	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course Learning Outcomes:

After the completion of the course, the students will have the ability to

a) *Recognize that food is a basic requirement of life.*
b) *Describe basic food preparation techniques.*
c) *Identify the physical, chemical, and/or microbiological changes in food caused by heat, enzymes, changes in pH, freezing, incorporation of air, and mechanical manipulation.*
d) *Understand food quality.*
e) *Learn fundamentals of modifying recipes to meet current nutrition recommendations for fat, cholesterol, fiber, etc. without sacrificing flavor or appearance.*
f) *Learn to find credible sources of information for food science and nutrition.*

COURSE CONTENT

THEORY

Unit 1: Food and Nutrition: Basic Concepts

Food, Nutrition, Health, Primary Health Care and Nutritional Status (Definition, Interrelationship in Maintaining Good Health and Well-being); Food (Functions and Constituents of Food – Nutrient and Food Groups: Basic concepts; Nutrients (Macro & Micro, Nutraceutical): Functions, Sources, Digestion, Absorption, Utilization and Requirements; Recommended Dietary allowances and RDA for Indians (ICMR 2010 & 2020) and their uses in planning diets; Concept of BMR & SDA.

Unit 2: Digestive System: A Major System of Nutrition

Basic Concept of Digestive System, Digestive Juices and Their Functions; Digestion and Absorption of Macronutrients; Absorption of Micronutrients: Vitamins, Calcium, Iron, Magnesium, Sodium, Potassium; Common Disorders in Digestive System: Ulcer, Diarrhoea, Lactose Intolerance; Constipation: Causes, Symptoms, and Brief Dietary Management.

Unit 3: Nutrition through the Life Cycle

Nutrition during Infancy (0-1years) and Preschool Years (1-6 Years): Infancy, Preschool Period (Critical from Growth, Development View Point, Nutrient Requirements- Infant and Young \Child Feeding Practices, Planning Balanced Diet for Infants, Preschoolers and Special Considerations for Feeding Young Children; Nutrition During Childhood and Adolescent: Growth, Development, Nutrient Needs, Meeting Nutrient Needs Through Planning Balanced Diets, Packed Lunches Factors Influencing Food and Nutrient Needs during Adolescence (Peer Pressure, Body Image, Media, Stress, Fasting); Nutrition during Adulthood and Old Age: Factors Influencing Nutritional Requirements (Age, Gender, Activity Level-Sedentary, Moderate, Heavy) Nutrient Needs (RDA) and Meeting Requirement by Planning Balanced Diets; Nutrition during Pregnancy and Lactation.

Unit 4: Nutrition Awareness & Public Health: Basic Concept

Definition of Awareness, Awareness Generation Process, Knowledge-Attitude- Practice; Public Health Concept, Determinants of Public Health; Nutritional Awareness Impact on Public Health; Strategies adopted for Nutritional Awareness Generation on Public Health at Rural Sectors; Child to Child Strategy, Child to Parent Strategy, Women to Women Strategy.

Unit 5: Undernutrition Management from Intrauterine Life to Adulthood

Types of Undernutrition, Causes of Undernutrition at Different Phases of Human Life Cycle; Major Deficiency Disorders: (PEM in the Context of Underweight, Stunting, Wasting); SAM; Nutritional Anaemia with Special Reference to Iron Deficiency Anaemia; Vitamin A Deficiency (Xeropthalmia); Iodine Deficiency Disorders; Zinc Deficiency: Prevalence, Causes, Consequences and Its Control; Other Nutritional Problems: Vitamin B Complex Deficiencies, Vitamin C Deficiency, Vitamin D Deficiencies.

REFERENCES/ SUGGESTED READINGS

1. Jelliffe DB. Assessment of the Nutritional Status of the Community; World HealthOrganisation.
2. Sahn DE, Lockwood R,Scrimshaw NS(1988): Methods the Evaluation of the Impact ofFood and Nutrition Programmes, 2nd Printing, United Nations University.
3. Ritchie, JAS(1979): Learning Better Nutrition , Nutritional Studies number 20,

FAO,Rome.
4. Gopaldas T and SeshadriS(1988): Nutrition Monitoring and Assessment, OxfordUniversity Press.
5. Mason JB, Habicht, JP, Tabatabai H and ValverdeV(1984): Nutritional Surveillance,World Health Organisation.
6. Park K(2017): Textbook of Preventive and Social Medicine,24th Ed. BanarsidasBhanotPublishers.
7. King MH, King PMA, Morley D and AP Burgess(2015):Nutrition for DevelopingCountries, ELBS Oxford University Press.
8. Passmore R and Eastwood MA (1986): Davidson and Passmore's Human Nutrition &Dietetics , 8th Revised Ed. Churchill Livingstone.
9. SeshubabuVVR(2011): Review in Community Medicine, 2nd Ed, Paras Medical BooksPvt Ltd.
10. Mahajan BK, Roy RN ,Saha I, Gupta, MC (2013):Text book of Preventive and SocialMedicine, 4th Ed. Japee Brothers.
11. VirSC(2011): Public Health Nutrition in Developing Countries, Woodhead PublishingIndia.
12. Bamji MS, Krishnaswamy K and BrahmamGNV(2017): Textbook of Human Nutrition ,4th Ed. Oxford & IBH Publishing Co. Pvt. Ltd.
13. Suryatapa Das (2018) Textbook of Community Nutrition 2nd Ed. Academic Publishers.

MINOR COURSE-1

COURSE NAME: FUNDAMENTAL OF NUTRITION SCIENCE-I

COURSE CODE: BSCNUTMN101

Course Type: **Minor (Theoretical)**	Course Details: MNC-**1**		L-T-P: 4 **- 1 - 0**	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course Learning Outcomes:

After the completion of the course, the students will have the ability to

a) Recognize that food is a basic requirement of life.
b) Describe basic food preparation techniques.

c) *Identify the physical, chemical, and/or microbiological changes in food caused by heat, enzymes, changes in pH, freezing, incorporation of air, and mechanical manipulation.*
d) *Understand food quality.*
e) *Learn fundamentals of modifying recipes to meet current nutrition recommendations for fat, cholesterol, fiber, etc. without sacrificing flavor or appearance.*
f) *Learn to find credible sources of information for food science and nutrition.*

COURSE CONTENT

THEORY

Unit 1: Food and Nutrition: Basic Concepts

Food, Nutrition, Health, Primary Health Care and Nutritional Status (Definition, Interrelationship in Maintaining Good Health and Well-being); Food (Functions and Constituents of Food – Nutrient and Food Groups: Basic concepts; Nutrients (Macro & Micro, Nutraceutical): Functions, Sources, Digestion, Absorption, Utilization and Requirements; Recommended Dietary allowances and RDA for Indians (ICMR 2010 & 2020) and their uses in planning diets; Concept of BMR & SDA.

Unit 2: Digestive System: A Major System of Nutrition

Basic Concept of Digestive System, Digestive Juices and Their Functions; Digestion and Absorption of Macronutrients; Absorption of Micronutrients: Vitamins, Calcium, Iron, Magnesium, Sodium, Potassium; Common Disorders in Digestive System: Ulcer, Diarrhoea, Lactose Intolerance; Constipation: Causes, Symptoms, and Brief Dietary Management.

Unit 3: Nutrition through the Life Cycle

Nutrition during Infancy (0-1years) and Preschool Years (1-6 Years): Infancy, Preschool Period (Critical from Growth, Development View Point, Nutrient Requirements- Infant and Young \Child Feeding Practices, Planning Balanced Diet for Infants, Preschoolers and Special Considerations for Feeding Young Children; Nutrition During Childhood and Adolescent: Growth, Development, Nutrient Needs, Meeting Nutrient Needs Through Planning Balanced Diets, Packed Lunches Factors Influencing Food and Nutrient Needs during Adolescence (Peer Pressure, Body Image, Media, Stress, Fasting); Nutrition during Adulthood and Old Age: Factors Influencing Nutritional Requirements (Age, Gender, Activity Level-Sedentary, Moderate, Heavy) Nutrient Needs (RDA) and Meeting Requirement by Planning Balanced Diets; Nutrition during Pregnancy and Lactation.

Unit 4: Nutrition Awareness & Public Health: Basic Concept

Definition of Awareness, Awareness Generation Process, Knowledge-Attitude- Practice; Public

Health Concept, Determinants of Public Health; Nutritional Awareness Impact on Public Health; Strategies adopted for Nutritional Awareness Generation on Public Health at Rural Sectors; Child to Child Strategy, Child to Parent Strategy, Women to Women Strategy.

Unit 5: Undernutrition Management from Intrauterine Life to Adulthood

Types of Undernutrition, Causes of Undernutrition at Different Phases of Human Life Cycle; Major Deficiency Disorders: (PEM in the Context of Underweight, Stunting, Wasting); SAM; Nutritional Anaemia with Special Reference to Iron Deficiency Anaemia; Vitamin A Deficiency (Xeropthalmia); Iodine Deficiency Disorders; Zinc Deficiency: Prevalence, Causes, Consequences and Its Control; Other Nutritional Problems: Vitamin B Complex Deficiencies, Vitamin C Deficiency, Vitamin D Deficiencies.

REFERENCES/ SUGGESTED READINGS

1. Jelliffe DB. Assessment of the Nutritional Status of the Community; World HealthOrganisation.
2. Sahn DE, Lockwood R,Scrimshaw NS(1988): Methods the Evaluation of the Impact ofFood and Nutrition Programmes, 2nd Printing, United Nations University.
3. Ritchie, JAS(1979): Learning Better Nutrition , Nutritional Studies number 20, FAO,Rome.
4. Gopaldas T and SeshadriS(1988): Nutrition Monitoring and Assessment, OxfordUniversity Press.
5. Mason JB, Habicht, JP, Tabatabai H and ValverdeV(1984): Nutritional Surveillance,World Health Organisation.
6. Park K(2017): Textbook of Preventive and Social Medicine,24th Ed. BanarsidasBhanotPublishers.
7. King MH, King PMA, Morley D and AP Burgess(2015):Nutrition for DevelopingCountries, ELBS Oxford University Press.
8. Passmore R and Eastwood MA (1986): Davidson and Passmore's Human Nutrition &Dietetics , 8th Revised Ed. Churchill Livingstone.
9. SeshubabuVVR(2011): Review in Community Medicine, 2nd Ed, Paras Medical BooksPvt Ltd.
10. Mahajan BK, Roy RN ,Saha I, Gupta, MC (2013):Text book of Preventive and SocialMedicine, 4th Ed. Japee Brothers.
11. VirSC(2011): Public Health Nutrition in Developing Countries, Woodhead PublishingIndia.
12. Bamji MS, Krishnaswamy K and BrahmamGNV(2017): Textbook of Human Nutrition ,4th Ed. Oxford & IBH Publishing Co. Pvt. Ltd.
13. Suryatapa Das (2018) Textbook of Community Nutrition 2nd Ed. Academic Publishers.

SKILL ENHANCEMENT COURSE-1

COURSE NAME: COMMUNITY NUTRITION AND EPIDEMIOLOGY

COURSE CODE: BSCNUTSE101

Course Type: **SEC (Theoretical)**	Course Details: SEC-**1**		L-T-P: **3 - 0 - 0**	
Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**15**	……	**35**

Course Learning Outcomes:

After the completion of course, the students will have the ability to

a) Acquire knowledge in epidemiological aspects
b) Become professionals in Public health Nutrition
c) Excel in assessment of nutritional status on the community
d) Develop comprehensive skills in public health nutrition
e) Explore opportunities in government and NGOs as public health nutritionist

COURSE CONTENT

THEORY

Community Nutrition

1. Concept of Community and its Type, Factors affecting Health of Community- Environmental, Social, Cultural and Economic.
2. Community Health Data-Span and Vital Statistics of Infants, Child and Maternal Mortality Statistical Data Analysis (Mean, Median, Mode, Students 'T' Test)
3. Nutritional Assessment: Different Anthropometric Measurement and Interpretation, Clinical Signs, BMI, Body Fat Percentage, Use of Growth Charts.
4. Diet Survey-Importance Methods, Concept of Consumption Units, Distribution of Food- Individual in Family.
5. Concept of Nutritional Surveillance System and International, National and Regional Agencies Organizations, Nutritional Intervention Programmes-ICDS, Mid-Day Meal Programme, National Prophylaxis.
6. Malnutrition: Introduction, Causes and Prevention.

Epidemiology

1. Epidemiology of Nutrition Related Disease; Study of Epidemiological Approaches; Determinant of Diseases; Preventive and Social Means; Incidence & Prevalence Rate of Disease; Epidemiological Triad.
2. Different Methods of Epidemiological Studies; Case Study, Case Control Study, Cohort Study.
3. Community of Food Protection; Epidemiology of Food Borne Disease: Mode of Transmission, Control and Prevention.
4. Community Water and Waste Management: Water Borne Infections Agent, Safe Drinking Water, Potable Water, Waste and Waste Disposed; Sewage Treatment, Solid & Liquid Waste Disposal.

References/ Suggested Readings

1. Jelliffe DB. Assessment of the Nutritional Status of the Community; World Health Organization.
2. Sahn DE, Lockwood R, Scrimshaw NS(1988): Methods the Evaluation of the Impact of Food and Nutrition Programmes, 2nd Printing, United Nations University.
3. Ritchie, JAS (1979): Learning Better Nutrition, Nutritional Studies number 20, FAO, Rome.
4. Gopaldas T and Seshadri S (1988): Nutrition Monitoring and Assessment, Oxford University Press.
5. Mason JB, Habicht, JP, Tabatabai H and ValverdeV (1984): Nutritional Surveillance, World Health Organisation.
6. Park K (2017): Textbook of Preventive and Social Medicine, 24th Ed. Banarsidas Bhanot Publishers.
7. King MH, King PMA, Morley D and AP Burgess (2015): Nutrition for Developing Countries, ELBS Oxford University Press.
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10. Mahajan BK, Roy RN, Saha I, Gupta, MC (2013):Text book of Preventive and Social Medicine, 4th Ed. Japee Brothers.
11. VirSC(2011): Public Health Nutrition in Developing Countries, Woodhead Publishing India.
12. Bamji MS, Krishnaswamy K and BrahmamGNV(2017): Textbook of Human Nutrition ,4th Ed. Oxford & IBH Publishing Co. Pvt. Ltd.
13. Suryatapa Das (2018) Textbook of Community Nutrition 2nd Ed. Academic Publishers.

SEMESTER: II

MAJOR COURSE-2

COURSE NAME: FUNDAMENTAL OF NUTRITION SCIENCE-II

COURSE CODE: BSCNUTMJ201

Course Type: **Major (Theoretical)**	Course Details: MJC-**2**			L-T-P: 4 - **1** - **0**	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course Learning Outcomes:

After the completion of course, the students will have the ability to

a) *Recognize that food is a basic requirement of life.*
b) *Describe basic food preparation techniques.*
c) *Identify the physical, chemical, and/or microbiological changes in food caused by heat, enzymes, changes in pH, freezing, incorporation of air, and mechanical manipulation.*
d) *Understand food quality.*
e) *Learn fundamentals of modifying recipes to meet current nutrition recommendations for fat, cholesterol, fiber, etc. without sacrificing flavor or appearance.*
f) *Learn to find credible sources of information for food science and nutrition.*

COURSE CONTENT

THEORY

Unit 1: Mother Child Health Care

Definition of Health Care, and Types; Teenager Pregnancy as Double Burden Pregnancy, Undernutrition Teenager Pregnancy as Triple Burden Pregnancy; Mother and Child as a Single Unit; Antenatal Care, Intra Natal Care, Postnatal Care; Child Care and Child Immunization; Care in Breast Feeding; Weaning: Definition, Process of Weaning, Hygiene and Sanitation of Weaning; Supplementary Feeding of Preschool Children: Brief Description.

Unit 2: Diet in Health and Disease

Causes, Physiological Conditions, Clinical Symptoms and Dietary Management of Fever (Typhoid, Tuberculosis), Eating Disorders (Anorexia Nervosa, Bulimia, Binge Eating), Overweight/Obesity; Brief Concept of Dietary Management of Hypertension and Diabetes.

Unit 3: Food Safety and Quality Control

Food Hazards: Physical, Chemical and Biological; Food Borne Diseases (Cholera, Typhoid, and Salmonellosis): Concept, Causes and Preventive Measures; Personal Hygiene; Food Hygiene and Sanitation, Environmental Sanitation and Safety (Water Supply, Waste Disposal) at Home Level; Food Adulteration: Concept/Definition as Given By FSSAI; Common Adulterants Present in Foods (Cereals, Pulses, Milk and Milk Products, Fats and Oils, Sugar, Honey, Spices and Condiments), Ill Effect of Adulterants (Metanil Yellow, Argemone, Kesari Dal) on Human Health; Common Methods for Detecting Adulteration at Home; FSSAI Act 2006; Reading and Understanding Food Labels with Reference to Food Products.

Unit 4: Nutrition Education, Communication and Behaviour Change

Information, Education and Communication (IEC) for Behaviour Change: Definition; Nutrition Education: Need, Scope and Importance; Process of Nutrition Education Communication; Nutrition Communication: Media and Multi-Media Combinations; Types of Interpersonal Communication- Individual and Group Approach, Mass Media, Traditional Media.

Unit 5: Health Care System

Ecological Concept of Health Care System; Primary, Secondary, Tertiary Health Care System; Prevention of Diseases: Primordial, Primary, Secondary, and Tertiary Prevention; Village Level Health Care System: Role of Anganwadi Workers, ASHA Workers, Multipurpose Health Workers, Role of Sub Centers, ICDS Centers.

REFERENCES/ SUGGESTED READINGS

1. Jelliffe DB. Assessment of the Nutritional Status of the Community; World Health Organisation.
2. Sahn DE, Lockwood R,Scrimshaw NS(1988): Methods the Evaluation of the Impact of Food and Nutrition Programmes, 2nd Printing, United Nations University.
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12. Bamji MS, Krishnaswamy K and BrahmamGNV(2017): Textbook of Human Nutrition ,4th Ed. Oxford & IBH Publishing Co. Pvt. Ltd.
13. Suryatapa Das (2018) Textbook of Community Nutrition 2nd Ed. Academic Publishers.

MINOR COURSE-2

COURSE NAME: FUNDAMENTAL OF NUTRITION SCIENCE-II

COURSE CODE: BSCNUTMN201

Course Type: **Minor (Theoretical)**	Course Details: MNC-**2**		L-T-P: 4 **- 1 - 0**	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course Learning Outcomes:

After the completion of course, the students will have the ability to

g) Recognize that food is a basic requirement of life.
h) Describe basic food preparation techniques.
i) Identify the physical, chemical, and/or microbiological changes in food caused by heat, enzymes, changes in pH, freezing, incorporation of air, and mechanical manipulation.
j) Understand food quality.

k) *Learn fundamentals of modifying recipes to meet current nutrition recommendations for fat, cholesterol, fiber, etc. without sacrificing flavor or appearance.*

l) *Learn to find credible sources of information for food science and nutrition.*

COURSE CONTENT

THEORY

Unit 1: Mother Child Health Care

Definition of Health Care, and Types; Teenager Pregnancy as Double Burden Pregnancy, Undernutrition Teenager Pregnancy as Triple Burden Pregnancy; Mother and Child as a Single Unit; Antenatal Care, Intra Natal Care, Postnatal Care; Child Care and Child Immunization; Care in Breast Feeding; Weaning: Definition, Process of Weaning, Hygiene and Sanitation of Weaning; Supplementary Feeding of Preschool Children: Brief Description.

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Causes, Physiological Conditions, Clinical Symptoms and Dietary Management of Fever (Typhoid, Tuberculosis), Eating Disorders (Anorexia Nervosa, Bulimia, Binge Eating), Overweight/Obesity; Brief Concept of Dietary Management of Hypertension and Diabetes.

Unit 3: Food Safety and Quality Control

Food Hazards: Physical, Chemical and Biological; Food Borne Diseases (Cholera, Typhoid, and Salmonellosis): Concept, Causes and Preventive Measures; Personal Hygiene; Food Hygiene and Sanitation, Environmental Sanitation and Safety (Water Supply, Waste Disposal) at Home Level; Food Adulteration: Concept/Definition as Given By FSSAI; Common Adulterants Present in Foods (Cereals, Pulses, Milk and Milk Products, Fats and Oils, Sugar, Honey, Spices and Condiments), Ill Effect of Adulterants (Metanil Yellow, Argemone, Kesari Dal) on Human Health; Common Methods for Detecting Adulteration at Home; FSSAI Act 2006; Reading and Understanding Food Labels with Reference to Food Products.

Unit 4: Nutrition Education, Communication and Behaviour Change

Information, Education and Communication (IEC) for Behaviour Change: Definition; Nutrition Education: Need, Scope and Importance; Process of Nutrition Education Communication; Nutrition Communication: Media and Multi-Media Combinations; Types of Interpersonal Communication- Individual and Group Approach, Mass Media, Traditional Media.

Unit 5: Health Care System

Ecological Concept of Health Care System; Primary, Secondary, Tertiary Health Care System; Prevention of Diseases: Primordial, Primary, Secondary, and Tertiary Prevention; Village Level

Health Care System: Role of Anganwadi Workers, ASHA Workers, Multipurpose Health Workers, Role of Sub Centers, ICDS Centers.

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1. Jelliffe DB. Assessment of the Nutritional Status of the Community; World Health Organisation.
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13. Suryatapa Das (2018) Textbook of Community Nutrition 2nd Ed. Academic Publishers.

SKILL ENHANCEMENT COURSE-2

COURSE NAME: FUNDAMENTALS OF FOOD SCIENCE

COURSE CODE: BSCNUTSE201

Course Type: **SEC (Theoretical)**	Course Details: SEC-**2**		L-T-P: **3 - 0 - 0**	
Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**15**	……	**35**

Course Learning Outcomes

After the completion of the course, the students will have ability to

a) Gain knowledge on food groups, food pyramid and understand cooking methods with the application in balanced menu planning.
b) Apply the knowledge of nutritional classification, understand the changes in pigments and acquire skills in preserving nutrients and pigments in the processing and storage of vegetables and fruits.
c) Collect knowledge on nutritive value, understand the cooking quality factors and develop skills in the preparation and storage of milk and egg products.
d) Gather knowledge on the structure and nutritive value, understand the processing factors and acquire skills in processing and storage of flesh foods.
e) Gain skills to process and store cereals, pulses, nuts and oilseeds.

COURSE CONTENT

THEORY

Basic Concept of Food and Nutrition, Classification of Food & Nutrition, Food Group

1. **Carbohydrate:** Definition, Properties, Classification with Structure, Sources, Daily Requirement & Function; Effect of Too High & Too Low Carbohydrate on Health, Blood Glucose, Glycemic Index.

2. **Lipids:** Properties, Sources, Daily Requirement & Function; PUFA; MUFA; SFA; Omega Fatty Acid-Composition: Properties, Type & Nutritional Significance.

3. **Proteins:** Definition, Sources, Daily Requirement & Functions; Effect of Too High &

Too Low Proteins on Health: Assessment, Factors Effecting Protein Bio-Availability Including Anti-Nutritional Factors, Amino Acid Classification, Type, Structure & Function.

4. **Special Food Type & Components:** GM Food, Super Food, Organic Food, Fast Food, Junk Food, Convenience Food, Prebiotics, Probiotics, Antioxidants.

5. **Food Standards:** ISI, Agmark, FPO, MPO, PFA, FASSI.

6. **Sensory Characteristics of Food:** Types, Importance.

7. **Cereals and Pulses:** Cereals Products, Breakfast Cereals, Processing and Storage, Varieties, and use in Different Preparations, Nutritional Aspect.

8. **Milk and Milk Products:** Composition, Classification, Selection Quality, Processing Storage and Use in Different Preparations, Nutritional Aspect.

9. **Fish, Meat and Poultry (Meat, Egg)):** Types, Selection, Storage, Uses, Spoilage and Its Detection, Nutritional Aspect.

10. **Vegetables and Fruits:** Types, Selection, Storage, Availability, Nutritional Aspect of Raw and Processes Products and Use in Different Preparations.

11. **Fats and Oils, Sugar, Bakery, Beverages:** General Concepts about Their Nutritional Aspects.

References/ Suggested Readings

1. SrilakshmiB(2017): Nutrition Science,6th Multicolour Ed. New Age International (P) Ltd.
2. RodayS(2012): Food Science and Nutrition, 2nd Ed. Oxford University Press.
3. Mann J and TruswellS(2017) : Essentials of Human Nutrition, 5th Ed. Oxford University Press.
4. Wilson K and Walker J(2000): Principles and Techniques of Practical Biochemistry, 5th Ed. Oxford University Press.
5. Sadasivan S and ManikamK(2007): Biochemical Methods, 3rd Ed. New Age International (P) Ltd.
6. Oser B L(1965). Hawk's Physiological Chemistry, 14th Ed. McGraw-Hill Book
7. Nath RL and NathRK(1990). Practical biochemistry in clinical medicine, 2nd Ed. Academic Publishers.
8. Sen AR, Pramanik NK and Roy SK(2001): A treatise on analysis of food fat and oil, Oil Technologists Association of India (EZ), Kolkata, 76, 119.

9. Swaminathan MS Food Science, Chemistry and Experimental Foods, Bangalore Print
10. & Publishing Company.
11. SrilakshmiB(2018): Food Science, 7th Colour Ed. New Age International (P) Ltd.
12. Lavies, S (1998): Food Commodities Ltd. London.
13. Hughes O and Bennion, M (1970): Introductory Foods, 5th Ed. Macrnillan& Co., New York.
14. Parker R and Pace M (2016):Introduction to Food Science and Food Systems, 2nd Ed. Delmar Cengage Learning.
15. Meyer LH(2004): Food Chemistry, 1st Ed. CBS Publishers and Distributors, New Delhi.
16. Mudambi SR, Rao SM and Rajagopal MV(2006): Food Science, 2nd Ed. New Age
17. International (P) Ltd.
18. Manay SN and Shadaksharaswamy, M. (2008): Foods: facts and principles , 3rd Ed. New Age International (P) Ltd.
19. Potter NN and Hotchkiss JH(1999): Food science,5th Ed, Spinger.

MULTIDISCIPLINARY COURSE-2

COURSE NAME: NUTRITION & PUBLIC HEALTH

COURSE CODE: MDC206

Course Type: **MD (Theoretical)**	Course Details: MDC-**2**		L-T-P: 3-**0**-**0**	
Credit:3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**15**	……	**35**

Course Learning Outcomes

After the completion of the course, the students will have the ability to

a) Acquire knowledge in epidemiological aspects
b) Become professionals in Public health Nutrition
c) Excel in assessment of nutritional status on the community
d) Develop comprehensive skills in public health nutrition
e) Opportunities in government and NGOs as public health nutritionist

COURSE CONTENT

THEORY

Unit 1: Food and Nutrition: Basic Concepts

Food, Nutrition, Health, Primary Health Care and Nutritional Status: Definition, Interrelationship in Maintaining Good Health and Well-being; Food: Functions and Constituents of food; Nutrient and Food Groups: Basic Concepts; Nutrients (Macro & Micro, Nutraceutical): Functions, Sources, Digestion, Absorption, Utilization and Requirements; Recommended Dietary Allowances and RDA for Indians (ICMR 2010 & 2020) and Their Uses in Planning Diets; Concept of BMR & SDA.

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Nutrition during Infancy (0-1years) and Preschool Years (1-6 Years): Infancy, Preschool Period (Critical from Growth, Development View Point, Nutrient Requirements- Infant and Young \Child Feeding Practices, Planning Balanced Diet for Infants, Preschoolers and Special Considerations for Feeding Young Children; Nutrition During Childhood and Adolescent: Growth, Development, Nutrient Needs, Meeting Nutrient Needs Through Planning Balanced Diets, Packed Lunches Factors Influencing Food and Nutrient Needs during Adolescence (Peer Pressure, Body Image, Media, Stress, Fasting); Nutrition during Adulthood and Old Age: Factors Influencing Nutritional Requirements (Age, Gender, Activity Level-Sedentary, Moderate, Heavy) Nutrient Needs (RDA) and Meeting Requirement by Planning Balanced Diets; Nutrition during Pregnancy and Lactation.

Unit 3: Public Health: Basic Concept

Definition of Awareness, Awareness Generation Process, Knowledge-Attitude- Practice; Public Health Concept: Determinants of Public Health; Nutritional Status Assessment by Anthropometric Method; Nutritional Awareness Impact on Public Health; Strategies Adopted for Nutritional Awareness Generation on Public Health at Rural Sectors: Child to Child Strategy, Child to Parent Strategy, Women to Women Strategy.

Unit 4: Public Health Epidemiology

Epidemiology of Malnutrition Related Diseases in Community; Study of Epidemiological Approaches; Determinant of Diseases: Preventive and Social Means; Incidence & Prevalence Rate of Disease; Epidemiological Triad. Different Methods of Epidemiological Studies: Case Study, Case Control Study, Cohort Study.

References/Suggested Readings

1. Jelliffe DB. Assessment of the Nutritional Status of the Community; World Health Organisation.
2. Sahn DE, LockwoodR, ScrimshawNS(1988): Methods the Evaluation of the ImpactofFoodandNutritionProgrammes,2ndPrinting,UnitedNationsUniversity.
3. Ritchie, JAS (1979):Learning Better Nutrition, Nutritional Studies number 20,FAO, Rome.
4. Gopaldas Ta nd Seshadri S(1988): Nutrition Monitoring and Assessment ,Oxford University Press.
5. Mason JB, Habicht, JP, Tabatabai H and ValverdeV (1984): Nutritional Surveillance, World Health Organisation.
6. Park K (2017): Textbook of Preventive and Social Medicine, 24th Ed. Banarsi das Bhanot Publishers.
7. King MH ,King PMA, Morley D and AP Burgess (2015):Nutrition for Developing Countries,ELBS Oxford University Press.
8. Passmore R and Eastwood MA(1986):Davidson and Passmore's Human Nutrition &Dietetics, 8th Revised Ed.Churchill Livingstone.
9. Seshubabu VVR (2011):Reviewin Community Medicine,2ndEd,Paras Medical Books Pvt Ltd.
10. Mahajan BK, RoyRN,S ahaI, Gupta, MC (2013): Textbook of Preventive and Social Medicine,4thEd. Japee Brothers.
11. Vir SC(2011):Public Health Nutritionin Developing Countries, Woodhead Publishing India.
12. Bamji MS, Krishnaswamy K and Brahmam GNV(2017):Textbook of Human Nutrition,4th Ed.Oxford & IBH Publishing Co. Pvt. Ltd.
13. Suryatapa Das (2018) Textbook of Community Nutrition 2nd Ed. Academic Publishers.

SEMESTER: III

MAJOR COURSE-3

COURSE NAME: NUTRITIONAL PHYSIOLOGY

COURSE CODE: BSCNUTMJ301

Course Type: Major (Theoretical+ Practical)	Course Details: MJC-3			L-T-P: 3 - 0 - 4	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Learning Outcomes:

After the completion of the course, the students will have the ability to

1. Understand the structure and functions of the various organ systems of the body
2. Relate the structure with the functions of the tissues and organs
3. Comprehend the mechanism of action of organs
4. Relate the Physiology of the human body with Food and Nutritional requirements
5. Recognize the clinical symptoms of nutritional deficiencies based on anatomical considerations

COURSE CONTENT

THEORY

Unit 1: Cell and Immune System

Structure & Function of Cells: Structure and Function of Plasma Membrane, Nucleus, Mitochondria, Golgi Bodies, Endoplasmic Reticulum, Ribosome, Lysosome, Microsome, Peroxisome; Cell Cycle: Basic Concept; Apoptosis, Necrosis, Oxidative Stress and its Management.

Immunology: Cellular Immunity; Humeral Immunity; Active and Passive Immunity; Complement System; Vaccination Program; Nutrients as Immune Modulator.

Unit 2: Cardio-Pulmonary

Cardiovascular System: Blood- Composition of Blood, Function of Blood, Erythropoiesis, Blood Group, Blood Transfusion & Its Hazards, Coagulation of Blood; Heart Structure &

Function of Heart, Heart Rate, Cardiac Cycle & Cardiac Output; Blood Pressure & Its Controls; The General Course of Blood Circulation; Cardiovascular Diseases: Basic Concept.

Respiratory System: The Structure of Respiratory System; Mechanism of Breathing & Its Control; Oxygen and Carbon Dioxide Transport in Blood; Vital Capacity & Other Lung Volumes; Acclimatization; Different Types of Hypoxia; Respiratory Diseases- Basic Concept; Artificial Breathing.

Unit 3: Gastrointestinal and Excretory

Gastrointestinal System: Structure & Function of Various Organ of GI Tract; Digestion of Food Absorption of Nutrients; The Role of Enzymes & Hormones on Digestion; Prebiotics, Probiotics, Gut Microbiome: Basic Concept.

Excretory System: Structure & Function of Kidney & Bladder; Formation of Urine; Role of Kidney in Homeostasis; Structure & Function of Skin & Body Temperature Control; Basic Concept of Renal Diseases.

Unit 4: Nervous and Muscular System

Nervous System: Elementary Amatory of Narrow System; Function of Different Parts of the Brain in Brief; Sympathetic & Parasympathetic Nervous System; Special Senses.

Musculoskeletal System: Types of Muscle, Function & Structure; Skeletal System; Formation of Bone & Teeth (General Idea); Energy Source in Different Phases of Muscular Activities; Muscle Glycogen.

Unit 5: Endocrine and Reproductive System

Endocrine System: Structure & Function; Deficiency & Excess Symptoms; Hypothalamus; Pituitary; Thyroid; Parathyroid; Pancreas; Adrenal Gland; Ovary, Testes, Placenta, Gastro-Intestinal Hormones.

Reproductive Events: Hormonal Control of Puberty; Menstrual Cycle and Menopause; Spermatogenesis and its Hormonal Control; Infertility; Stress and Reproduction; Role of Nutrients on Reproductive Activities.

PRACTICAL

1. Identification of Prepared Slides: (A) Tongue (B) Lungs (C) Thyroid (D) Cerebral Cortex (E) Testis (F) Ovary (G) Kidney (H) Liver (I) Pancreas (J) Small Intestine – Duodenum, Ilium, Jejunum, (K) Large Intestine, (L) Spinal Cord (M) Cerebellum (N) Uterus.
2. Preparation of Blood Film and Identification of White Blood Cells, Counting of Blood Cells.

3. Estimation of Hemoglobin (Colorimetric Method).
4. Determination of Bleeding Time and Clotting Time of Blood, Blood Grouping.
5. Measurement of Blood Pressure and Pulse Rate.
6. Study of Muscle Fibers and Squamous Epithelium.
7. Qualitative Assessment of Glucose, Blood, Ketone Bodies in Urine.

REFERENCES/ SUGGESTED READINGS

1. Chatterjee CC (1988). Text Book of Physiology – Vol I & II.
2. SK (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
3. Guyton AC, Hall JE (1966). Text book of Medical Physiology.9th Ed. Prism (Pvt.) Ltd. Bangalore..
4. Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.
5. Winword (1988). Sear's Anatomy and Physiology for Nurses.London, Edward Arno.
6. Koeppen BM and Stanton BA(2017): Berne and Levy Physiology, 7th Ed. Elsevier
7. Rhoades R and Pflanzer R (2003): Human Physiology, 4th ed. Thomson.
8. Eroschenko VP(2007): diFore's Atlas of Histology, diFiore's Atlas of Histology with Functional Correlations, 11th Edition. Lippincott Williams & Wilkins.
9. McLaughlin D, Stamford J and White D(2006): Bios Instant Notes on Human Physiology,1stEd. Taylor & Francis.

MAJOR COURSE-4

COURSE NAME: NUTRITIONAL BIOPHYSICS AND BIOCHEMISTRY

COURSE CODE: BSCNUTMJ302

Course Type: Major (Theoretical+ Practical)	**Course Details: MJC-4**			**L-T-P: 3 - 0 - 4**	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Learning Outcomes:

After the completion of the course, the students will have the ability to

1. *Gain knowledge on coherent and systematic knowledge on carbohydrate, lipid, and amino acid metabolism.*
2. *Apply the knowledge of enzymology in nutrition.*
3. *Understand the mechanism adopted by the human body for regulation of metabolic pathways.*
4. *Learn the basics of DNA, RNA, and translation*
5. *Know the roles of vitamins and minerals.*

COURSE CONTENT

THEORY

Unit 1: Biophysics, and Cellular Transport System

Introduction to Biophysics; Interrelationship between Biophysics and Nutrition; Cell Membrane Transport: Passive Diffusion, Facilitated Diffusion and Active Transport, Ion Channels, Symport, Antiport, Uniport Transport System; Osmosis: Plasmolysis and Deplasmolysis, Colloid and Surface Tension; Nanoparticle in A Human System; Glucose Transporters; Acid, Base, Buffer, Ph, and Acid-Base Balance.

Unit 2: Enzymes, Quantification Techniques and Thermodynamics

Enzymes: Definition, Types and Classification; Coenzyme: Definition and Types; Specificity of Enzymes; Isozymes; Enzyme Kinetics Including Factors affecting Velocity of Enzyme Catalyze Reactions; Enzyme Inhibition; Amylase and Protease Inhibitors; Principles of Colorimetry, Photometry, and Electrophoresis; Principles of Thermodynamics and Its Importance Innutrition.

Unit 3: Proximate Principles and their Metabolism

Introduction to Biochemistry; Interrelationship between Biochemistry and Nutrition. Intermediary Metabolism.

a. **Carbohydrates:** Classification of Carbohydrate, Monosaccharides and its Different Types; Stereoisomers of Monosaccharides; Optical Activity of Monosaccharides; Reactions of Monosaccharides; Reducing and Non-Reducing Sugar; Polysaccharide Bonds: Simple Chains, Side Chain, Different Structures, Glycolysis, TCA Cycle And Electron Transport Chain, Gluconeogenesis, Glycogenesis, Glycogenolysis, HMP Shunt, Blood Glucose Regulation, Glycemic Index.

b. **Proteins Peptides and Amino Acid:** Classification, Structure in Brief, Properties, Protein Quality (BV, PER, NPU), Deamination, Transamination, Urea Cycle, Elementary Idea about Protein Synthesis.

c. **Lipids:** Classification, Structure and Properties, Saturated and Unsaturated Fatty Acids, their Importance, B-Oxidation of Fatty Acids, Ω-Oxidation, Ketone Bodies-Generation, Utilization, Fatty Liver, Fat Synthesis.

d. **Lipid Transport:** Lipoproteins and Its Types (LDL, VLDL, HDL) Composition, Role, and Significance in Diseases.

Unit 4: Structure and Function of Micronutrients

Vitamins: Water and Fat-Soluble Vitamins, Structure and Function: Deficiency and Diseases; Pseudo Vitamins, Provitamins, Antivitamins, Vitamin Like Biomolecule- Definition and Example.
Minerals: Biochemical Role of Ca, Na, K, Fe, Se, I, Zn.

Unit 5: Nutraceuticals, Water and Nucleic Acids

Dietary Fibre Classification, Properties, Nutritional and Therapeutic Significance; Antioxidants, Nutraceuticals-Preliminary Idea, Natural Source; Water Metabolism & Balance (In Brief); Regulation of Body Water Balance, Intracellular and Extracellular Water; Nucleic Acids: Structure, DNA Replication, Transcription, Genetic Code.

PRACTICAL

1. General Qualitative Tests for Carbohydrates, Reducing and Non-reducing Sugars, Monosaccharides, Aldoses and Ketoses, Disaccharides and Polysaccharides.
2. Qualitative Tests for Simple Proteins and Derived Proteins.
3. Qualitative Tests for Bile Salts.
4. Qualitative Tests for Fat, Glycerol, and Cholesterol.
5. Qualitative Test For Detecting Saccharine, Metanil Yellow, Casein, and Vanaspati In Different Foodstuff Starch in Milk.
6. pH Determination of Solution Using pH Paper/ pH Meter, Solution Preparation Of Different Normality Molarity.
7. Quantification of Starch, Lactose, and Sucrose in Different Foodstuffs.
8. Quantification of Total Protein in Food.
9. Quantification of Calcium, Iron, Vitamin-C, and Vitamin-A In Food.

REFERENCES/ SUGGESTED READINGS

1. Murray RK, Bender DA, Botham KA, Mayes PA and RodwellVW(2015):Harper's Biochemistry, 30th Ed. Lange Medical Book.
2. Handler P, Smith EI, Stelten DW: Principles of Biochemistry, McGraw Hill Book Co. 3.Nelson DL and Cox MM (2017): Lehninger Principles of Biochemistry. 7th Ed. WH Freeman.
3. Devlin TM (2010): Text Book of Biochemistry with Clinical Correlations. John Wiley and Sons.
4. BergJM,Tymoczko JL, Gatto GJ and Stryer L(2015): Biochemistry, 8th Ed WH Freeman and Co.
5. Stryer. L. Biochemistry. Freeman W.H. and Co. 6. Assaini. J. Kaur. Text Book of Biochemistry. C.B.S. Publication.
6. U Satyanarayana, U Chakrapani. Text Book of Biochemistry. Books & Allied (P) Ltd.

MINOR COURSE-3

COURSE NAME: PHYSIOLOGY AND BIOCHEMISTRY IN NUTRITION

COURSE CODE: BSCNUTMN301

Course Type: Minor (Theoretical)	**Course Details: MNC-3**			**L-T-P: 4- 1 - 0**	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
			30		**70**

Course Learning Outcomes:

After the completion of course, the students will have the ability to

a) Understand the Structure and Functions of the various organ systems of the body
b) Relate the Structure with Functions of the tissues and organs
c) Comprehend the Mechanism of Action of Organs
d) Relate the Physiology of the human body with Food and Nutritional requirements

COURSE CONTENT

THEORY

Unit 1: Cellular System

Structure and Function of Cells: Structure and Function of Plasma Membrane, Nucleus,

Mitochondria, Golgi Bodies, Endoplasmic Reticulum, Ribosome, Lysosome, Microsome, Peroxisome; Cell Cycle: Basic Concept; Oxidative and its Management.

Unit 2: Cardiovascular System

Blood Composition and Function: Group, Transfusion and its Hazards, Coagulation; Heart Rate: Cardiac Cycle and Blood Pressure.

Unit 3: Gastrointestinal System

Gastrointestinal Intestinal System: Structure of Various Organs of GI Tract, Directional and Absorption of Food.

Unit 4: Nervous and Endocrine System

Nervous System: Elementary Anatomy of the Nervous System; Brief Function of Different Components of Brain, Sympathetic and Parasympathetic Nervous System and Special Senses; Endocrine System: Function, Deficiency and Excess Symptoms of Different Endocrine Organs (Thyroid, Parathyroid, Pancreas, Adrenal); Concept of GI Hormones.

Unit 5: Introduction of Macro and Micro Nutrients

Carbohydrate, Protein and Fat: Definition, Properties and Function; Classification, Daily Requirement and their Role on Health; Mineral, Vitamins & Water: Sources, Physiological Function, Deficiency Symptoms, and Water Metabolism.

REFERENCES/ SUGGESTED READINGS

1. Chatterjee CC (1988). Text Book of Physiology – Vol I & II.
2. SK (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
3. Guyton AC, Hall JE (1966). Text book of Medical Physiology.9th Ed. Prism (Pvt.) Ltd. Bangalore..
4. Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.
5. Winword (1988). Sear's Anatomy and Physiology for Nurses. London, Edward Arno.
6. Koeppen BM and Stanton BA(2017): Berne and Levy Physiology, 7th Ed. Elsevier
7. Rhoades R and Pflanzer R (2003): Human Physiology, 4th ed. Thomson.
8. U Satyanarayana, U Chakrapani. Text Book of Biochemistry. Books & Allied (P) Ltd.
9. Debojyoti Das. Biophysics & Biophysical Chemistry, Academic Publishers.

SEMESTER: IV

MAJOR COURSE-5

COURSE NAME: INTRODUCTION TO DIET THERAPY

COURSE CODE: BSCNUTMJ401

Course Type: Major (Theoretical+ Practical)	Course Details: MJC-5			L-T-P: 3 - 0 - 4	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Learning Outcomes:

The course will help the learners on basic understanding in the following manner:

a) *Diet formulation system*
b) *Nutrient allotment system*
c) *Varieties of diet*
d) *Dietary counseling and educating patients*
e) *Hands on training for planning and preparation of 'Diet Chart' and 'Menu Planning' in different scenarios.*

COURSE CONTENT

THEORY

Unit 1: Concept of Diet and Its Classification

Basic Concepts of Diet therapy: Modification of Normal Diet to Therapeutic Diet, Its Principles And Classification; Energy Computation on Work Pattern; Balanced Diet, Standard Diet, Adequate Diet.

Classification of Diet: Energy Rich and Low, Carbohydrate High and Low, Protein High and Low, Fat High and Low, Fibre High and Low, Na-High and Low, Routine Diet, Soft Diet, Fluid Diet, DASH Diet, Paleo Diet, Atkins Diet, Mediterranean Diet, Keto Diet, Vegan Diet, MIND Diet, Intermittent Fasting.

Unit 2: Food Groups and Food Exchange System

Food Groups: ICMR Classification; Food Pyramid; My Food Plate; Cereals and Millets, Pulses, Milk and Milk Products; Meat, Fish, Poultry and Its Products, Fruits and Vegetables, Fats and Sugars, Nutrient Analysis Table.

Food Exchange List System: Concept, Significance and its Application.

Unit 3: Diet Counselling and Patient Education: Fundamental Concept

Diet Counselling and its Advantages; Basic Principles for Preparation of Diet; Formulation Of Diet Chart; Principle of Energy Distribution in Different Meals/Day; Diet in Infancy, Pre-School Going Children and Adolescents: Principles and Steps in Planning Menu.

Unit 4: Nutrient Allocation in Different Phases of Life Cycle

Macronutrients Allocation on The Basis of Daily Energy Requirements; Micronutrients Allocation: their Importance in Different Phases of Life Cycle.

Unit 5: Planning and Preparation of Diet Formulation

Meal Frequency; Energy Distribution in Different Meals; Concept of RDA and Average Energy Requirement for Meal Preparation; Energy Requirement for BMR out of Daily Needs of Energy; Concept of REE for Meal Preparation; Relation Between Energy Load in Meal and Workload for Different Meals.

Planning and Preparation of Income Dependent Diet Formulation for Different Phases of Life Cycle of Human: Infant, Pre-School Children, School Going Children, College Students, Adult, Geriatric Person, Pregnant and Lactating Mother, Sports Person.

PRACTICAL

1. Calculation of Energy Requirement- Basal Stats, Different Grade of Work, 24 Hours Energy Requirement Calculation on The Basis of Types of Work, Body PAL (Physical) Activity Level), Height, Weight, PA.
2. Requirement of Carbohydrate, Protein, Fat on the Basis of Energy Calculation.
3. Energy Distribution in Breakfast, Lunch and Dinner for Pre-Lunch and Post-Lunch Workers, Menu-Planning and Nutritional Analysis.
4. Balance Sheet Preparation in Different Meals.
5. BMR Computation on the Basis of Total Daily Energy and Nutrient Supply for It.
6. Resting Energy Expenditure Computation from BMR and its Nutrient Supply.

REFERENCES/ SUGGESTED READINGS

1. Basic concepts of clinical nutrition; Y.K. Joshi. Jaypee Publishers.
2. Text book of Clinical nutrition; Krause.
3. Text book of nutrition & Child development; K.E. Elizabeth.
4. Text book of human nutrition; Mehtab S. Bamji.
5. Clinical Nutrition; Nutrition society.
6. ESPEN/ASPEN guidelines. 7. Rbinson C.H; Lawer M.R Mc Millan Pub.com…. Normal and Therapeutic Nutrition.

MAJOR COURSE-6

COURSE NAME: FOOD PRESERVATION: CHEMICAL AND MICROBIAL APPROACHES

COURSE CODE: BSCNUTMJ402

Course Type: Major (Theoretical+ Practical)	**Course Details: MJC-6**			**L-T-P: 3 - 0 - 4**	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	**20**	**35**

Course Learning Outcomes:

The course will help the learners on basic understanding in the following manner:

a) Food preservation techniques
b) Food spoilage and packaging
c) Food Safety
d) Various non-traditional food items
e) Hands on skill for understanding of different aspects of food safety

COURSE CONTENT

THEORY

Unit 1: Food Preservation: Different Methods

General Concept of Food Preservation: Importance of Food Preservation, Food Safety, Limitation of Food Preservation; Physical Methods of Food Preservation: Thermal Processing, Irradiation, Dehydration, Microwave, Chilling and Freezing, Refrigeration.

Chemical Methods of Food Preservation: Water Activity (A_w) in Food Preservation, Role of Sugar, Salt, Chemicals, Acidification, Natural Spices; Microbial Preservation: Fermentation, Using Beneficial Microbes, Curd, Idli, Dosa, and their Nutritional Importance.

Unit 2: Food Spoilage

Bacterial Growth and its Different Phases: Bacterial Growth-Extrinsic and Intrinsic Factors; Food Spoilage: Contamination of Microorganisms in the Spoilage of Cereal and Cereal Products; Vegetables and Fruits; Fish and other Seafood; Meat and Meat Products; Egg and Poultry; Milk and Milk Products; Canned Foods.

Unit 3: Food Packaging

Concept of Food Packaging; Classification of Food Packaging: Plastic, Modified Air Packaging (MAP), Flexible Packaging, Control Air Packaging (CAP), Nano-sensor Packaging (NSP); Importance of Packaging.

Unit 4: Non-Traditional Food Items

Fast Food, Junk Food and Processed Food: Jam, Jellies, Pickles, Syrup; Squashes: their Composition, Manufacturing Process, Use, and Nutritional Aspects; Preserved Food: General Composition and their Effects on Public Health; Industrial Processing of Oil, Milk, Vanaspati, Vinegar, Vitamin B12, and Citric Acid; Food Fortification.

Unit 5: Food Pollution and Food Safety

Food Additive, Food Adulterant and Food Contaminants: Types and their Impacts on Public Health; Food Safety Agencies and Their Regulations.

PRACTICAL

1. Preparation of Jam and Jellies.
2. Efficacy Testing of the Method of Food Preservation by Bacterial Load Assessment per Field in Different Duration-Dependent Samples.
3. Visit to the Food Industry and Report Preparation on Food Processing and Packaging Preservation, Plant Sanitation, and Hygiene.

REFERENCES/ SUGGESTED READINGS

1. Text book of microbiology; Michael .J Pelczar; Tata McGraw-Hill
2. Text book of bacteriology; A.J. Salle. Tata McGraw-Hill.
3. Text book of food microbiology; Adam Moss.
4. Text book of food toxicology; CRC press.
5. Practical microbiology; New Age International publishers.

6. Modern food microbiology; J.M Jay. Springer.
7. Food Microbiology; W.C Frazier, Tata McGraw-Hill.
8. Industrial Microbiology; Prescott SC .Dunn CG (2009).
9. FOODS: Shakuntala Manay; New Age International Publishers.
10. Food preservation; A text book for student; teacher, W.W Chenoweth
11. Food processing and food preservation; B. Shivsankar.
12. Meyer, Food Chemistry, New Age 2004.

MINOR COURSE-4

COURSE NAME: FOOD SCIENCE AND FOOD COMMODITIES

COURSE CODE: BSCNUTMN401

Course Type: Minor (Theoretical)	**Course Details: MNC-4**			**L-T-P: 4- 1 - 0**	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
			30		**70**

Course Learning Outcomes

After the completion of course, the students will have the ability to

a) Acquire knowledge in nutritional aspects
b) Acquire knowledge in preservation and processing aspects of food
c) Become professionals in food preservation and processing
d) Understand the importance of food commodities.

COURSE CONTENT

THEORY

Unit 1: Macronutrients

a. **Carbohydrate:** Definition, Properties, Classification with Structure, Sources, Daily Requirement & Function; the Effects of Too High and Too Low Carbohydrate on Health, Blood Glucose, Glycemic Index.

b. **Lipids:** Properties, Sources, Daily Requirement and Function, PUFA, MUFA, SFA, Omega Fatty Acid: Composition and Nutritional Signification.

c. **Proteins:** Definition, Sources, Daily Requirement and Functions; The Effect of Too High & Too Low Proteins on Health; Assessment, Factors affecting Protein Bio-Availability Including Anti-Nutritional Factors; Amino Acid Classification: Type, Structure & Function.

Unit 2: Special Food Types, Food Additives and Food Standards

Special Food Types and Components: GM Food, Superfood, Organic Food, Fast Food, Junk Food, Convenience Food, Prebiotics, Probiotics, and Antioxidants; Food Standards: ISI, Agmark, FPO, MPO, PFA, FASSI; Sensory Characteristics of Food: Types, Importance; Food Additives: Type, Impact on Health; Food Processing and Food Packaging: General Concept.

Unit 3: Cereals, Pulses and Vegetables

a. **Cereals and Millets:** Cereals Products, Breakfast Cereals, Processing, and Storage.

b. **Pulses and Legumes:** Varieties, Storage, Processing and Use in Different Preparations, Nutritional Aspect.

c. **Vegetables and Fossils:** Types, Selection, Storage, Availability, Nutritional aspect of Raw and Processed Products and Use in Different Preparations.

Unit 4: Protein and Fat Food Items

a. **Milk and Milk Products**: Composition, Classification, Selection Quality, Processing Storage and Use in Different Preparations, Nutritional Aspect.

b. **Fish, Meat, and Poultry (Meat, Egg):** Types, Selection, Storage, Uses, Spoilage and Its Detection, Nutritional Aspect.

c. **Fats and Oils:** Types and Sources, Processing (Refining) Uses in Different Preparation, Storage, Nutritional Aspect.

Unit 5: Bakery, Sugar Products and Beverages

a. **Sugar and Sugar Products:** Types of Natural Structures, Manufacture, Storage, and Uses as Preserver.

b. **Basic Bakery and Confectionary Items (Bread, Biscuit, Cake, and Pastry):** Manufacturing and Nutritional Aspects.

c. **Salt:** Types and Uses.

d. **Beverages (Tea, Coffee, Chocolate, and Cocoa):** Nutritional Significance, Other Beverages- Aerated Beverages, Impact on Health.

REFERENCES/ SUGGESTED READINGS

1. Srilakshmi B (2014): Dietetics, 7th Multicolour Ed. New Age International (P) Ltd.
2. Guthrie AH (1986): Introductory Nutrition, 6th Revised Ed., McGraw-Hill Inc., US.
3. Swaminathan M (2007): Essentials of Food and Nutrition (Vol. I & II), 2nd Ed.
4. Gopalan C, Rama Sastri BV and Balasubramanian SC (2016): Nutritive value of Indian Foods, Indian Council of Medical Research.
5. U Satyanarayana, U Chakrapani. Text Book of Biochemistry. Books & Allied (P) Ltd.
6. Debojyoti Das. Biophysics & Biophysical Chemistry, Academic Publishers.

SKILL ENHANCEMENT COURSE-3

COURSE NAME: FOOD MICROBIOLOGY, PRESERVATION AND PROCESSING

COURSE CODE: BSCNUTSE401

Course Type: **SEC (Practical)**	Course Details: SEC-**3**		L-T-P: 0 **- 0 - 6**	
Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	….	20	….

Course Learning Outcomes

After the completion of course, the students will have the ability to

a) Explain the concepts of food microbiology
b) Advocate the importance of food preservation technique
c) Analyze the quality of the food sample
d) Find the current advancements in the industry

COURSE CONTENT

PRACTICAL

1 Preparation of Liquid (Broth) and Solid Media, Slant and Stab.
2. Pure Culture of Microbiological Techniques: Spread Plate, Pour Plate, and Streak Plate.

3. Staining of Microorganisms: Simple Stain, Differential Stain (Gram Staining).
4. Biochemical Tests for Characterization: Catalase, Indole Formation, Nitrate-Reduction, Sugar Fermentation Test.
5. Microbiological Examination of Milk: Methylene Blue Reduction Test.
6. Preparation of Jam and Jellies.
7. Efficacy Testing of the Method of Food Preservation by Bacterial Load Assessment per Field in Different Duration-Dependent Samples.
8. Visit to Food Industry and Report Preparation on Food Processing and Packaging Preservation, Plant Sanitation, and Hygiene.

REFERENCES/ SUGGESTED READINGS

1. Frazier WC and Westhoff D C and Vanitha NM (2017): Food Microbiology, 5th Ed. MaGraw Hill Education..
2. Jay JM (2005): Modern Food Microbiology, 3rd Ed. CBS Publishers & Distributors.
3. Pelczar M, Chan ECS, Krieg N(2009): Microbiology : Application Based Approach, Tata McGraw Hill Education.
4. Benson HJ(2001): Microbiological Applications: Complete Version: A Laboratory Manual inGeneral Microbiology, 8th Ed. McGraw-Hill Publishing Co.
5. Colling CE and Lyne PM (1976): Microbiological Methods, Butterworth. London.
6. Bamrart G(2012): Basic food Microbiology, 2nd Ed. (Reprint), Spinger.
7. Wood BJ(1998):Microbiology of Fermented Foods, Vol I & II, 2nd Ed. Spinger.
8. Joshi VK(2009): Biotechnology: Food Fermentation Microbiology, Biochemistry &
9. Technology, Vol I &Vol II , Educational Publishers & Distributors.

SEMESTER: V

MAJOR COURSE-7

COURSE NAME: NUTRITION IN PHASES OF HUMAN LIFE CYCLE

COURSE CODE: BSCNUTMJ501

Course Type: Major (Theoretical)	Course Details: MJC-7			L-T-P: 4 - 1 – 0	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course Learning Outcomes:

After the completion of course, the students will have the ability to

- ***a)*** *Students will learn about the specific nutritional requirements of each life stage, including infancy, childhood, adolescence, adulthood, pregnancy, lactation, and old age.*
- ***b)*** *Students will be able to correlate physiological changes at different life stages with corresponding nutrient needs and dietary recommendations.*
- ***c)*** *Students will develop an understanding of healthy dietary patterns and how to make appropriate food choices for each life stage.*

COURSE CONTENT

THEORY

Unit 1: Basic Concept of Energy Requirements

Body Composition and its Changes in Different phases of Life; Minimum Nutritional Requirement and Recommended Dietary Allowances; Reference Man, Reference Woman; Energy in Human Nutrition: Energy and its Units, Energy Balance, Energy Requirement of Body; Basal Metabolic Rate (BMR) Factors Affecting Measurement of BMR; Specific Dynamic Action (SDA); Calorific Values of Food; Determination of Energy in Food.

Unit 2: Nutrition during Pregnancy and Lactation

Determining Nutritional Requirements for Different Physiological Stages of Life Cycles: Preschool, Adolescents, Adults and Geriatric Phases, RDA, Food Exchange List; Pregnancy: Physiological Changes in Pregnancy and Nutrient Requirements, Impact of Good Nutrition on

the Outcome of Pregnancy, Complications of Pregnancy and their Nutritional Management; Lactation and Infancy: Physiology of Lactation, Impact of Nutrition on Efficiency and Production of Milk, Breast Feeding Vs Artificial Feeding, Importance of Weaning and Supplementary Food, Role of Nutrition on Physical and Mental Development, Types of Milk and their Use in Infant Feeding, Assessment of Growth.

Unit 3: Infants and Preschool Children's Nutrition

Nutrition during Infancy: Breast Feeding, Formula Feeding, Weaning, Supplementary Foods, Nutritional Management of Preterm and Low Birth Weight Baby; Preschool Age and Childhood: Growth and Development, Food Habits, Prevalence of Malnutrition in Preschool Years, Specific Problems in Feeding School Children; Nutrition for Children: Diet in Early Childhood, Elementary School Age, High School Age.

Unit 4: Adolescence and Adulthood Nutrition

Adolescence: Physical and Physiological Changes, Food Preferences, Macro and Micro Nutrient Requirements, Nutritional Problems; Eating Disorder: Anorexia Nervosa and Bulimia; Adulthood: Macro and Micron Nutrient Requirement in Different Types of Work Patterns.

Unit 5: Geriatric Nutrition

Geriatric: Physical and Physiological Changes, Nutritional Requirement, Problems of Old Age, Nutrients Influencing Aging Process.

REFERENCES/ SUGGESTED READINGS

1. "Nutrition through the Life Cycle" by Carolyn Sharbaugh.
2. "Nutrition: A Lifecycle Approach" by Orient Blackswan.
3. "Nutrition through the Life Cycle" by Judith Brown.
4. "Nutrition across Life Stages" by Bernstein and McMahon.
5. "The Academy of Nutrition and Dietetics Complete Food and Nutrition Guide" by the Academy of Nutrition and Dietetics.
6. "Dietetics" by B Srilakshmi.
7. "Nutrition and Dietetics" by Shubhangini A Joshi.
8. "Nutrition: A Lifecycle Approach" by Ravinder Chadha and Pulkit Mathur.
9. "Expanding Horizons of Nutrition" 1st Edition, 2022 By Elizabeth K Eapen, Dr Ramesh Kumar & Piyush Gupta.

MAJOR COURSE-8

COURSE NAME: THERAPEUTIC DIET-1

COURSE CODE: BSCNUTMJ502

Course Type: Major (Theoretical & Practical))	Course Details: MJC-8			L-T-P: 3 - 0 – 4	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	20	**35**

Course Learning Outcomes:

After the completion of the course, the students will have the ability

- ***a)*** *To understand the various kinds of diets in a hospital and dietary management in energy imbalance.*
- ***b)*** *To create an understanding about the etiology, risk factors, clinical features and dietary management of various gastrointestinal disorders and diabetes.*
- ***c)*** *To modify diets, based on disease-specific needs.*
- ***d)*** *To understand the physiological impact of various conditions on nutrient requirements, and develop the ability to counsel patients on dietary modifications.*

COURSE CONTENT

THEORY

Unit 1: Introduction to Dietetics

Principles of Diet Therapy; Therapeutic Modification of Normal Diets; Types of Hospital Diets: Clear-Fluid, Full Fluid and Soft Diet; Special Feeding Methods: Enteral and Parenteral Nutrition.

Unit 2: Energy Imbalance: Obesity

Obesity: Definition, Types, Aetiology, Assessment and Complications; Management of Obesity: Exercise, Diet, Behavior Modification, Pharmacotherapy and Surgery; Underweight: Aetiology, Complications, Dietary Modifications; Concepts of Bariatric Surgery.

Unit 3: Therapeutic Diet for Non-Communicable Diseases

Nutritional Care in Gastro-Intestinal Disorders, Diabetes and Febrile Conditions, Fever; **Gastro-Intestinal Disorders**: Aetiology, Symptoms, Diagnosis, Treatment and Dietary Approaches of Peptic Ulcer, Diarrhea, Constipation; **Diabetes Mellitus**: Types, Aetiology, Symptoms,

Diagnosis, Complications, Treatment– Exercise, Hypoglycemic Drugs, Insulin and Diet, Dietary Management-Glycemic Index and Food Exchange List; **Cardio Vascular Diseases:** Types, Aetiology, Sign and Symptoms, Diagnosis, Dietary Management of Hypertension and Atherosclerosis.

Unit 4: Therapeutic Diet of Nutritional Anaemia

Anaemia: General Concept, Aetiology, Classification, and Dietary Management of Nutritional Anaemia.

Unit 5: Nutritional Management of Renal Diseases

Renal Diseases: Introduction, Pathogenesis, Clinical Manifestation and Dietary Management, Glomerulonephritis, Nephrotic Syndrome, Acute Kidney Failure, Chronic Kidney Disease, Uremia, Dialysis, Urinary Calculi.

PRACTICAL

1. Planning of Therapeutic Diets.
2. Formulation of Fluid Diets Strategies.
3. Planning of Soft/Semi Solid Diets.
4. Diet Chart Preparation and Menu Formulation of Malaria Affected Patients.
5. Formulation of Diet Plans for the Following Diseases Using Exchange List:
    - **a)** Obesity
    - **b)** Peptic Ulcer
    - **c)** Diabetes Mellitus
    - **d)** Hypertension, Atherosclerosis
    - **e)** Anaemia
    - **f)** Glomerulonephritis, Nephrolithiasis.

REFERENCES/ SUGGESTED READINGS

1. A Comprehensive Textbook of Nutrition & Therapeutic Diets for B.Sc. & Post Basic Students, by Darshan Sohi (Author).
2. Nutrition and Diagnosis-Related Care – With Access, by Sylvia Escott-Stump.
3. Robinson's Basic Nutrition and Diet Therapy – Eighth Edition.
4. Basic Nutrition and Diet Therapy by Sue Rodwell Williams (Author).
5. Normal and Therapeutic Nutrition Paper by Corinne Hogden Robinson (Author), Marilyn Lawler (Author)
6. Nutrition and Diet Therapy by Carroll A. Lutz, Karen Rutherford Przytulski, F. A. Davis Company.
7. Krauses Food and Nutrition Care Process 14Th Edition by L Kathleen Mahan and Janice L Raymond, Elsevier Science.

8. Understanding Normal and Clinical Nutrition – 11th edition,by Sharon RadyRolfes, Kathryn Pinna and Ellie Whitney.

MAJOR COURSE-9

COURSE NAME: NUTRITION PROGRAMMING AND NUTRITION IN EMERGENCY

COURSE CODE: BSCNUTMJ503

Course Type: Major (Theoretical)	Course Details: MJC-9			L-T-P: 4 - 1 – 0	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course Learning Outcomes:

After the completion of the course, the students will have the ability

- ***a)*** *To familiarize with different types of disasters and understand the nutritional concerns in emergency situations.*
- ***b)*** *To assess various methods of nutritional status of the emergency affected populations.*
- ***c)*** *To differentiate between general feeding programme and selective feeding programme.*
- ***d)*** *To recognize the role of government, non-government bodies and international organizations in the management of nutrition in emergencies.*
- ***e)*** *To analyze and understand strategies for prevention and mitigation for the emergency affected populations.*

COURSE CONTENT

THEORY: NUTRITION PROGRAMMING

Unit 1: Concept of Nutrition Programme and Types

Definition of Nutrition Programmes: Program Planning, Steps Adopted for Formulation of Nutrition Programme, Objectives of Nutrition Programme; Types of Nutrition Programme: Supplementary Nutrition Programmes, Applied Nutrition Programmes, Features of Such Programmes and Applied Values.

Unit 2: Monitoring and Evaluation of Nutrition Programme

Monitoring and Evaluation of Nutrition Programme: Definition of Programme Monitoring, Types of Monitoring, Applied Values, Definition of Programme Evaluation, Types of Evaluation, Objectives of Evaluation and Applied Values.

Unit 3: Concepts and Types of Disasters

Concept and Types of Disasters (Natural/Manmade); Introduction to Different Types of Disasters, Factors Effecting Management of Disasters and Emergencies; Nutritional Concerns during Disaster and Emergencies among Vulnerable Populations: Causes of Malnutrition, Macro/Micro Nutrient Deficiencies.

THEORY: EMERGENCY NUTRITION

Unit 4: Nutritional Assessment in Emergency Situation

Assessment of Nutritional Status and Food Needs of Emergency Affected Populations: Food Distribution Strategies, Nutrition Monitoring and Surveillance, Screening and Assessment of Nutritional Status, Identifying and Reaching the Vulnerable Groups.

Unit 5: Nutrition Relief, Rehabilitation and Mitigation Strategies

Targeting Food Aid: Food Rations for Nutritional Relief and Rehabilitation (Special/Fortified Foods, Local Foods in Rehabilitation, Packed Food); Transportation of Food During Emergencies: Food Storage and Preventing Food Spoilage; Household Food and Nutrition Security; Post Emergency: Importance of Nutrition in Post-Emergency Situations; Disaster Prevention and Mitigation Strategies: Warning Systems, Role of Government and Non-Government Organizations, Nutritionists in Relief, Rehabilitation and Mitigation.

REFERENCES/ SUGGESTED READINGS

1. Disaster Management and Preparedness by Dhawan.
2. The Management of Nutrition in Major Emergencies, World Health Organization; 2nd edition (1 March 2000).
3. Text Book of Disaster Management" by A. K. Shrivastava.
4. Public Health Consequences of Disasters" by Eric Noji.
5. Park's Textbook of Preventive and Social Medicine by K. Park.
6. Nutrition in Emergencies and Disaster Management from Amrita Vishwa Vidyapeetham.
7. Survival Nutrition: A Primer on Maintaining Health and Energy during Emergencies by Willow Oakwood.

MINOR COURSE-5

COURSE NAME: DIET THERAPY

COURSE CODE: BSCNUTMN501

Course Type: **Minor (Theoretical)**	Course Details: MNC-**5**		L-T-P: 4 **- 1 – 0**	
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course Learning Outcomes:

After the completion of the course, the students will have the ability to understand:

- ***a)*** *Diet Formulation System*
- ***b)*** *Nutrient Allotment System*
- ***c)*** *Varieties of Diet*
- ***d)*** *Dietary Counseling and Educating Patients*
- ***e)*** *Hands on Training for Planning and Preparation of 'Diet Chart' and 'Menu Planning' in Different Scenarios.*

COURSE CONTENT

THEORY

Unit 1: Concept of Diet and Its Classification

Basic Concepts of Diet therapy: Modification of Normal Diet to Therapeutic Diet, Its Principles and Classification; Energy Computation on Work Pattern; Balanced Diet, Standard Diet, Adequate Diet; Classification of Diet: Energy Rich and Low, Carbohydrate High and Low, Protein High and Low, Fat High and Low, Fibre High and Low, Na-High and Low, Routine Diet.

Unit 2: Food Groups and Food Exchange System

Food Groups: ICMR Classification, Food Pyramid, Cereals and Millets, Pulses, Milk and Milk Products, Meat, Fish, Poultry and Its Products, Fruits and Vegetables, Fats and Sugars; Nutrient Analysis Table; Food Exchange List System: Concept, Significance and its Application.

Unit 3: Diet Counselling and Patient Education: Fundamental Concept

Diet Counselling and its Advantages; Basic Principles for Preparation of Diet; Formulation Of

Diet Chart; Principle of Energy Distribution in Different Meals/Day; Diet in Infancy, Pre-School Going Children and Adolescents: Principles and Steps in Planning Menu.

Unit 4: Nutrient Allocation in Different Phases of Life Cycle

Micronutrients Allocation: Its Importance in Different Phases of Life Cycle, Pregnancy and Lactation; Macronutrients Allocation on The Basis of Daily Energy Requirements.

Unit 5: Planning and Preparation of Diet Formulation

Concept of RDA and Average Energy Requirement for Meal Preparation; Meal Frequency; Energy Distribution in Different Meals; Relation Between Energy Load in Meal and Workload for Different Meals; Energy Requirement for BMR out of Daily Needs of Energy.

REFERENCES/ SUGGESTED READINGS

7. Basic concepts of clinical nutrition; Y.K. Joshi. Jaypee Publishers.
8. Text book of Clinical nutrition; Krause.
9. Text book of nutrition & Child development; K.E. Elizabeth.
10. Text book of human nutrition; Mehtab S. Bamji.
11. Clinical Nutrition; Nutrition society.
12. ESPEN/ASPEN guidelines. 7. Rbinson C.H; Lawer M.R Mc Millan Pub.com…. Normal and Therapeutic Nutrition.

SEMESTER: VI

MAJOR COURSE-10

COURSE NAME: SPORTS NUTRITION

COURSE CODE: BSCNUTMJ601

Course Type: Major (Theoretical & Practical)	Course Details: MJC-10			L-T-P: 3 - 0 - 4	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	20	**35**

Course learning Outcomes:

After the completion of course, the students will have the ability to

- ***a)*** *Understand the role of nutrition in athletic performance.*
- ***b)*** *Develop personalized diet plan for athletes.*
- ***c)*** *Understand the use and safety of sports supplements.*
- ***d)*** *Recognize special needs of different athlete population.*

COURSE CONTENT

THEORY

Unit 1: Basic Concept of Sports Nutrition

Introduction to Sports Nutrition: Definition, Importance of Sports Nutrition, Role of National and International Agencies in Sports Nutrition; Concept of Physical Activity, Exercise, and Sports; Divisions of Exercise and Sports Based on Energy Requirement and Macronutrient Demand.

Unit 2: Energy Sources in Different Sports Events

Nutrient Intake and Performance: Energy Intake Pattern of the Athlete-Nutritional Intake, Phosphagen System as Immediate Energy Source, Intensity of Training Impacting Carbohydrate Utilization, Type, Timing, and Quantity of Carbohydrate Intake In Resistance Training and Endurance Training, Food Source From Different Type of Carbohydrate, Carbohydrate Load; Type and Quality of Protein and its Utilization in the Body, Protein Turnover During Endurance Versus Resistance Training; Specific Role of Amino Acids for Performance; Amount of Fat Recommended for Varying Level of Training, Fitness and Recreational Sports; Idea of Pre-

Game, Intra-Game and Post-Game Meal; Dietary Assessment of Athlete: Different Methods of Dietary Assessment (Food and Fluid Intake), Description, Advantage And Disadvantage.

Unit 3: Dehydration Management and Sports Performance

Dehydration: Causes, Symptoms and its Effect on Cardiovascular System and Muscle Metabolism; Tolerable Levels of Dehydration; Synergistic Effect of Dehydration and Hyperthermia; Effect of Dehydration on Endurance Performance; Methods of Determining Degree of Dehydration among Athletes; Management of Dehydration: Idea of Sports Drinks, Homo and Hetero Monosaccharide Based Sports Drink.

Unit 4: Assessment of Physique and Body Composition of Sports Persons

Assessment of Physique: Kin Anthropometry- Definition, Introduction, Body Size and Proportion, Somatotyping, Circumferences, Skinfold Measurement Sites and Determining Body Composition, Applications; Idea About Aerobic and Anaerobic Sports Events; Oxygen Store House Concept; Body Composition and Performance: Factors that Affect Body Composition, Assessment and Interpretation of Anthropometric and Body Composition Data, Ideal Body Composition for Different Sports.

Unit 5: Ergogenic Aids and Sports Performance

Concept of Ergogenic Aids: Definition, Types; Dietary Ergogenic Aids: Creatine, BCAA, Beta-Alanine, Caffeine; Nitrates: Its Safety and Efficacy.

PRACTICAL

1. Assessment of Health and Fitness of Athletes.
2. Energy Balance: Calculation of Total Energy Expenditure (TEE) and Energy Intake.
3. Measuring Height, Body Mass, MUAC, and Skin Fold Thickness.
4. Assessment of Physical Performance of a Sports Person Through the Harvard Step Test.
5. Changes in Blood Pressure, Heart Rate, and Breathing Rate of a Sports Person in Different Games.
6. Body Composition Assessment of a Sports Person in Comparison to a Non-Athlete.

REFERENCES/ SUGGESTED READINGS

1. B Srilakshmi- “Exercise Physiology Fitness and Sports Nutrition”
2. Anita Bean- “Sports Nutrition”
3. Tanuj Choudhary- “Advance Sports Nutrition”.
4. Dr. Alok Mishra- “Sports Nutrition and balanced Diet”

5. Ms. Dilpreet Kaur, Mr. K. Govindasamy, Dr. R. Subhashini- "The Basics of Sports Nutrition".
6. Dr. Luna Dutta Baruah, Dr. Ninad Gor, Dr. Priyanka Kono- "A Textbook on Sports Nutrition".
7. Dr. M. Velvizhi, Mrs. Sudha U.V, Mrs Irfin Fathima- "Sports Nutrition".
8. Dr. Umesh Jugalkishor Rathi, Ajay Shrikrishnarao Bonde- "Guide to Sports Nutrition".
9. Dr. Vikram Shankarrao Kunturwar- " Sports Nutrition and Weight Mangement".
10. Dr. Tahir P. Hussain-"Handbook of Sports Nutrition".

MAJOR COURSE-11

COURSE NAME: THERAPEUTIC DIET-II

COURSE CODE: BSCNUTMJ602

Course Type: Major (Theoretical & Practical)	**Course Details: MJC-11**			**L-T-P: 3 - 0 – 4**	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	20	**35**

Course learning Outcomes:

After the completion of course, the students will have the ability to

a) *Understand the role of diet in disease management.*
b) *Identify nutritional needs in various communicable disease conditions.*
c) *Perform nutritional assessment of patients.*
d) *Define the concept of communicable disease.*
e) *Describe the concept of HIV AIDS.*
f) *Prepare and evaluate diet chart.*

COURSE CONTENT

THEORY

Unit-1 Liver Diseases

Communicable Hepatic Diseases: Jaundice, Hepatitis Factors, Pathophysiology, Symptoms, Dietary Management.

Unit-2 Immunodeficiency Diseases and Cancer: Dietary Management

Immuno-deficiency Viral Disease (AIDS): HIV-Aetiology, Symptoms, Diagnosis, Dietary Management; Cancer: Introduction, Pathogenesis, Clinical Manifestation and Dietary Management.

Unit-3 Dietary Management of IEM

Inborn Error of Metabolism: Causes, Types- Phenylketonuria, Galactosemia, Lactose; MSUD-Signs, Symptoms and Complication, Dietary Management,

Unit-4: Burn and Sepsis: Dietary Management

Burn and Sepsis: Introduction, Energy and Nutrient Requirement, Dietary Management.

Unit-5: Nutrient Drug Interaction

Interaction between Nutrients and Drugs: Effect of Drugs on Absorption, Utilization and Metabolism of Nutrients; Effect of Nutrients on Absorption and Utilization of Drugs.

PRACTICAL

1. Diet Chart Preparation and Menu Formulation of Diet for Jaundice and Hepatitis Patients.
2. Diet Chart Preparation and Menu Formulation of HIV Positive Individuals.
3. Diet Chart Preparation and Menu Formulation for Burn Patients.
4. Diet Chart Preparation and Menu Formulation for Cancer Patients.
5. Diet Chart Preparation and Menu Formulation for IEM Patients: Phenylketonuria, Galactosemia.

REFERENCES/ SUGGESTED READINGS

1. Joshi SA: “Nutrition & Dietetics”.
2. Williams SR: “Nutrition and Diet therapy”.
3. Antia FP and Abraham P: Clinical Dietetics and Nutrition.
4. Mahan LK and Escott- Stump S: Krause’s “Food and Nutrition Therapy”.
5. Souvik Tewari - “Diet to Control Disease”.
6. Sunita Pant Bansal - “Diet in Diseases”.
7. Avantina Sharma- “Principal of Therapeutic Nutrition and Dietetics”.
8. Richard Beliveau – “Food to fight Cancer”.
9. Eliva Rayfield- “The Complete Anti-Inflammatory Diet for Beginners”.
10. Sheel Sharma- “Human Nutrition, Meal Planning and Diet Therapy”.

MAJOR COURSE-12

COURSE NAME: NUTRITION EDUCATION AND COMMUNICATION

COURSE CODE: BSCNUTMJ603

Course Type: Major (Theoretical)	Course Details: MJC-12			L-T-P: 4 - 1 – 0	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course learning Outcomes:

After the completion of course, the students will have the ability to

- ***a)*** *Get knowledge about the principles and importance of nutrition education.*
- ***b)*** *Develop appropriate nutrition education materials.*
- ***c)*** *Understand about the utilization of mass and social media.*
- ***d)*** *Evaluate the effectiveness of 'Nutrition Education Programs'.*

COURSE CONTENT

THEORY

Unit 1: Fundamentals of Nutrition Education and Communication

Formal, Informal and Non-Formal Ways of Communication; Types and Classification of Communication: Verbal, Non-Verbal, Group Communication, Mass Communication and Public Communication; Introduction and Process of Nutrition Education and Communication: Understanding the Need and Scope of Nutrition Education, Upgradation, Potential Challenges and the Constraints of Nutrition Education; Importance of Nutrition Education; Role of Information, Education and Communication in Community Nutrition.

Unit 2: Theories of Nutrition Education and Communication

Nutrition Education Theories: Behavioral Theory, Cognitive- Gestaltist Theory, the Social Marketing Approach Theory, the Communication Approach Theory.

Unit 2: Phases of Nutrition Education

Phases of Nutrition Education Communication: Conceptual Phase, Identification of Vulnerable Person, Root Cause & solution.

Unit 4: Strategies of Nutrition Education Development

Development of Nutrition Education Program: Goals and Objectives Formulation, Identifying Target Audience, Structuring Message to be Delivered; Selection of Media/Channels: Methods (Traditional, Mass Media, Audio Visual Method), Criteria to Choose Media/Channels, Nutrition Education Communication Strategy Development.

Unit 5: Application of Nutrition Education

Application of Nutrition Education Program: Concept and Importance, Formulation of Potential Training Program of the Educator; Development of Educating Materials, Execution of Nutrition Education Communication; Intervention Strategic System of Community Participation

REFERENCES/ SUGGESTED READINGS

1. Dr. M Swaminathan- "Food and Nutrition"
2. Betsy B. Holli- "Communication and Education Skills for Dietetics Professionals.
3. Mohammed Somiya- "Nutrition and Communication Skills"
4. Dr. Khushboo Gupta – "Nutrition Education- An Important Pillar of Health.
5. Bhavana Sabarwal – "Community Nutrition and Health".
6. R. S. Reddy – " Nutrition Education"
7. R. C. Mishra- " Health and Nutrition Education"
8. Suryatapa Das – " Text Book of Community Nutrition"
9. Ida R. Laidyth- " Nutrition Education"

MAJOR COURSE-13

COURSE NAME: GENOMICS, PROTEOMICS, METABOLICS OF NUTRITION

COURSE CODE: BSCNUTMJ604

Course Type: Major (Theoretical)	**Course Details: MJC-13**			**L-T-P: 4 - 1 - 0**	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	……	**70**

Course learning Outcomes:

After the completion of course, the students will have the ability to

- ***a)*** *Understand the molecular basis of nutrition.*
- ***b)*** *Explain the concept of 'Nutrigenomics' and 'Nutrigenetics'.*
- ***c)*** *Interpret the role of 'Gene-Nutrient Interaction'.*
- ***d)*** *Apply proteomics in 'Nutrition Science'.*
- ***e)*** *Explore metabolomics in 'Nutritional Status Assessment'.*

COURSE CONTENT

THEORY

Unit 1: Fundamentals of Omics Studies

Genomics: Introduction, Organization and Structure of Genomes, Genome Size, Sequence, Complexity, Introns and Exons; **Proteomics:** Introduction, the Proteome, Bridging Genomics and Proteomics; **Metabolomics:** Introduction, Concept of Metabolome; Interrelationship among Genomics, Proteomics and Metabolomics.

Unit 2: Nutri Genomics

Concept of Nutri-Genomics; Model of Nutrient-Gene Interaction; Gene Identification and Expression: Genome Annotation, Traditional Route of Gene Identification, Identifying the Function of a New Gene; Overview of Comparatives Genomics; Role of Vitamin A, Omega 3, Fatty Acid, Zn on Gene Up and Down Regulation; Idea on Nutri-Epigenetics.

Unit 3 Nutri Proteomics

Areas of Proteomics: Structural Proteomics, Functional Proteomics, Expression Proteomics, Nutri Proteomics; Approaches for Study of Proteomics; Mass Spectrometry; Role of Nutrient on Structural, Functional and Expressional Proteomics.

Unit 4: Nutri Metabolomics

Introduction to Metabolism, Metabolic Pathways, Metabolite, Metabolomics; Approaches Employed to Study Metabolism; Role of Nutrients on Metabolomics; Importance of Nutri Metabolomics.

Unit 5: Interrelationship among Omics

Inter-Relationship between Genome, Transcriptome, Proteome and Metabolome; Metabolic Regulation and Control; Regulation of Glycolysis in Muscle as an Example of Metabolomics; Personalized Nutrition Based on Genomes, Proteomes and Metabolomics.

REFERENCES/ SUGGESTED READINGS

1. Mark Lucock- "Molecular Nutrition and Genomics"
2. Nova Martian :- "Personalized Nutrition through Genomics"
3. David Castle:- 'Nutrition and Genomics'
4. Carolyn D. Berdanier:-'Genomics and Proteomics in Nutrition'.
5. Debasis Bagchi, Anand Swaroop and Manashi Bagchi:- ' Genomics, Proteomics and Metabolomics in Nutraceuticals and Functional Food'.
6. Jesse Stevens:-'Introduction to Nutrition and Metabolism'.
7. Sandor Suhai- " Genomics and Proteomics"
8. Rakeeb Ahanad Mir, Sheikh Mansoor Shafi, Saad Majeed Zargar- " Principles of Genomics and Proteomics"

SUMMER INTERNSHIP (SI)

COURSE NAME: SUMMER INTERNSHIP
COURSE CODE: SI601

Course Type: Summer Internship	**Course Details: SIMC-1**			**L-T-P: 0 - 0 - 4**	
Credit: 2	Full Marks:50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	…	20	…

INTRODUCTION:

A key aspect of the new UG programme is the induction into actual work situations**.** All students will thereby undergo internships / Apprenticeships in a firm, industry, or organization or training in labs with faculty and researchers in their own or other HEIs/research institutions during the summer term.

Students will be provided with opportunities for internships with **home institutions/College, University**, **local industry, business organizations, health and allied areas, local governments (such as Panchayats, Municipalities), Parliament or elected representatives, media organizations, artists, crafts persons, and a wide variety of organizations** so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.

OBJECTIVES:

The internship programs for Employability are to be conceptualized and interactive for building research capabilities/aptitude/skills for:

1) Development of Project and its Execution.
2) Decision-making.
3) Confidence Development.
4) Working/coordinating in a Team.
5) Creative and Critical thinking and Problem-solving.
6) Ethical Values.
7) Professional Development.
8) Understanding Government/local Bodies Work.
9) Reference of Resource Persons in the Field.
10) Development of Online/ Simulation-based Module for a Virtual Research Internship.
11) Understanding the Nuances of Building a Deep-technology Start-up.
12) Entrepreneurship
13) Study of the Enterprises, Farmers, Artisans, etc.

DURATION OF INTERNSHIP:

60 working Hours for 2 Credits

The course may be conducted during the semester or within one month after completion of 6th Theory ESE (End Semester Examinations) including Evaluation.

INTERNSHIP DOMAINS

1. **Hospitals**: In any **Hospital** for 'Therapeutic Diet Analysis'.
2. **Public Health**: In any **Public Health Nutrition-Oriented Set Up** (Public/Private Institution) for Analyzing the Public Health Nutrition Status of a Particular Area.
3. **Food Industry**: In any **Food Industry** to Understand the Entire Manufacturing Protocols of Food Industries.

FOR EXAMINATION/ EVALUATION

- A report within 3000 to 5000 words to be prepared by the intern under the supervision of Supervisor from the parent institution (own college) and Mentor from host Institution.
- Internship Completion Certificate by the Mentors/Mentor and Supervisor.
- Self-assessment and feedback form to be submitted by the Intern.
- CA: 30 Marks will be assessed by the Supervisor from the parent institution as Continuous Assessment (CA) in consultation with the Mentor, depending upon performance and attendance of the intern, and report.

- ESE: 20 Marks will be assessed by the External and Internal faculty through seminar presentation and/or viva-voce at the parent institution,
- All Evaluation process along with mark capture for the Course: Summer Internship (SI601) must be completed by June every year.

NODAL OFFICER

Internship Programme will be fully organized, executed and monitored by the R&D cell of Institution through a **Nodal Officer** to be appointed by the Vice Chancellor/ Director/ Principal/ Head of the Institution.

If possible, make a registration system for internship program each year in the website of the parent Institutions so that next year onwards students may get help.

SEMESTER: VII

MAJOR COURSE-14

COURSE NAME: HEALTH STATISTICS

COURSE CODE: BSCNUTMJ701

Course Type: Major (Theoretical & Practical)	Course Details: MJC-14			L-T-P: 3 - 0 – 4	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	20	**35**

Course Learning Outcomes:

After the completion of the course, the students will have the ability to

- ***a)*** *Understand the knowledge in applications of statistical tests.*
- ***b)*** *Define the concept of statistics in health science.*
- ***c)*** *Enhance the application of statistics in health research.*
- ***d)*** *Analyze the data using statistical tools.*

COURSE CONTENT

THEORY

Unit-1: Basic Concept of Statistics and Data

Concept and Classification of Statistics: Statistics of Location, Dispersion, Inference and Correlation; Fundamentals about Data, Data Types & Its Presentation, Grouped and Ungrouped Data; Frequency Distribution: Concept, Discrete and Continuous, Tabulation of Data, Parts of a Table, Preparation of Blank Table, Association of Attributes, Contingency Table.

Unit-2: Statistical Graphics

Visual Presentation of Data: One Dimensional Diagrams, Two Dimensional Diagrams, Pictogram and Cartographs, Bar-diagram, Pie-Diagram, Histogram; Frequency Distribution: Frequency Polygon, Ogive, Normal Distribution, Scatter Gram.

Unit-3: Statistics of Locations

Measures of Central Tendency: Concept of Mean, Median & Mode; Computation of Central Tendency from Grouped and Ungrouped Data; Applications of Central Tendency; Basic Idea about Quartiles, Percentiles and Deciles.

Unit-4: Statistics of Dispersion, Inference and Correlation

Dispersion: Range, Mean Deviation, Standard Deviation & Standard Error, Variance, Correlation: Types and Its Computation, Person's Product Moment Correlation, Spearman's Rank Correlation, Coefficient of Variation, Coefficient and Its Interpretation; Regression: Concept, Types, Equations and Predictions.

Unit-5: Hypothesis and Its Testing

Hypothesis: Concept of Null and Alterative Hypothesis, Hypotheses Testing, Error I and II; Rules of Probability and Its Applications; Large and Small Sample Tests; **Parametric Test:** t-Test, One Tail and Two Tail Tests, Single Group, Paired Observation, Independent Groups, Comparison with Reference; Analysis of Variance: Basic Concept of One Way and Two Ways Anova, Models of Anova; **Non Parametric Test:** Chi Square Test- Test of Independence and Goodness of Fit; Wilcoxan Rank Test, Duncan's Test; Introduction of Statistical Software.

PRACTICAL

1. Presentation of Grouped data.
2. Graphical Presentation of Data: Histogram, Bar Diagram, Pie Diagram and Ogive.
3. Computation of Central Tendency, SD and SE of the Supplied Data.
4. Analysis of Test of Significant by Conducting Students 't' Test.
5. Test of Significance: Analysis of Chi Square.
6. Computation of Correlation of Supplied Data and Interpretation.
7. Computation of Regression Equation and Its Interpretation.

REFERENCES/ SUGGESTED READINGS

1. Debjyoti Das (2012). Biostatistics. Academic Publishers.
2. E. Batschelet : Introduction to Mathematics for Life Scientists, Springer, International Student Edition, Narosa Publishing House, New Delhi (1971, 1975).
3. Edmondson and D. Druce: Advanced Biology Statistics, Oxford University Press,1996.
4. W. Danial: Biostatistics-A foundation for Analysis in Health Sciences, John Wiley and Sons Inc, 2004.
5. Best, JW and Kahn, JV (1992) Research in Education. 6th Ed. New Delhi, Prentice Hall of India Pvt. Ltd.

6. Kothari, CR (2004) Research Methodology, Methods & Techniques, 2nded. New Age International Publishers.
7. Gilbert N. (1981). Statistics. 2nd ed. CBS College Publishing. Japan.

MAJOR COURSE-15

COURSE NAME: BIO-INFORMATICS AND COMPUTER APPLICATION

COURSE CODE: BSCNUTMJ702

Course Type: Major (Theoretical & Practical)	Course Details: MJC-15			L-T-P: 3 - 0 - 4	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**15**	20	**35**

Course Learning Outcomes:

After the completion of the course, the students will have the ability to

a) Understand biological databases, sequence analysis, genomics and proteomics.
b) Analyze and interpret biological data using computational techniques & tools
c) Use computational methods to solve biological problems.
d) Contribute in the field of research and development of the concerned field of bioinformatics
e) Enhance the skills to use computer based tools and techniques.

COURSE CONTENT

THEORY

Unit 1: Fundamentals of Bioinformatics and Basic Concept of Sequence Alignments

Bioinformatics and Health Informatics: Concept and Applications, Nucleic Acid and Protein Data Bases, Nutrient Data Bases; Sequence Similarity Searching By BLAST; Principle, Features and Types of BLAST; Significance of Multiple Sequence Alignments; Global Match, Local Match, Motif Match; Machine Learning/AI in Bioinformatics; Phylogenetic Tree.

Unit 2: Concept of Nucleic Acid and Nutrient Database

Nucleic Acid Data Bases: GenBank of USA, EMBL of Europe, DDBJ of Japan; Protein Data Bases: PIR, MIPS, SWISS-PROT, TrEMBL, NRL-3D and PDB; Nutrient Data Bases.

Unit 3: Application of Software in Nutrition

Introduction to MS Office: Word, Excel and PowerPoint; Introduction to Computer Basic Software: 'R', Python and Prompt Generation; Usage and Importance in Nutrition Science, Basic Troubleshooting; Learning Language Model: Neural Network Model, Docking.

Unit 4: AI Tools and Communication

Application of AI Tools for Writing, Editing, Presentation, Data Spreadsheet, Designing and Communication, Proof Correction, Plagiarism Check, Statistical Analysis, Graph Preparation.

Unit 5: Information and Communication Technology

Essential Importance of Internet; Data Safety Protocols; AI and Software for Computing, Nutrient Content and Development of Diet Plan, Nutritional Assessment and Measurements; Online Data Resource Access and Utilization.

PRACTICAL

1. Applications of BLAST and Preparation of Phylogenetic Tree.
2. Write a Program using Python and 'R' Software's.
3. Application of MS Excel from Data to Graphics.
4. Machine Learning, Systemic Tools.
5. Bio-informatics: Project Preparation, Submission and Presentation.

REFERENCES/ SUGGESTED READINGS

1. Lesk M.A. (2008) "Introduction to Bioinformatics". Oxford Publication, 3rd International Student Edition.
2. Rastogi S.C., Mendiratta N. and Rastogi P. (2007) "Bioinformatics: Methods and Applications, Genomics, Proteomics and Drug Discovery", 2nd ed. Prentice Hall India Publication.
3. Primrose and Twyman (2003) "Principles of Genome Analysis & Genomics", Blackwell.
4. Saxena Sanjay (2003) "A First Course in Computers", Vikas Publishing House.
5. Pradeep and Sinha Preeti (2007) "Foundations of Computing", 4th ed., BPB Publications.
6. Attwood TK et al. (2007). "Introduction to Bioinformatics". 1st ed.Person Education.
7. "Nutrigenetics and Metabolic Disease: Current Status and Implications for Personalized Nutrition", Journal Nutrients 2013,5,32-57.
8. Lesk A.M. (2009). "An Introduction to Bioinformatics". Ed 2. Oxford Principles of Gene Manipulation.
9. R.W. and S.B Primrose, "An Introduction to Genetic Engineering", 6th edition, Blackwell Science Inc.

MAJOR COURSE-16

COURSE NAME: FUNCTIONAL FOOD AND NUTRACEUTICAL

COURSE CODE: BSCNUTMJ703

Course Type: Major (Theoretical)	**Course Details: MJC-16**			**L-T-P: 4 - 1 - 0**	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	…	**70**

Course learning Outcomes:

After the completion of the course, the students will have the ability to

a) *Gain knowledge on the development of functional foods with the conceptual difference between functional foods and nutraceuticals.*
b) *Acquire skills to categorize nutraceuticals.*
c) *Gain awareness on the functional foods and nutraceuticals of biotics origin.*
d) *Apply the knowledge of functional nature of nutraceuticals and understand the regulatory aspects of functional foods and nutraceuticals.*

COURSE CONTENT

THEORY

Unit-1: Fundamentals of Nutraceuticals

Introduction to Functional Foods and Nutraceuticals: Concept, Background, Health Beneficial Effects of Nutraceuticals, Steps for the Development of Nutraceuticals, Functional Nature of Nutraceuticals; Polyphenols.

Unit-2: Nutraceuticals and Health Benefits

Categorization of Nutraceuticals: Classification Based on Food Source, Mechanism of Action and Chemical Nature of Isoprenoid; Phenolic Substances, Omega-3 Fatty Acids and Structural Lipids; Terpenoids, Saponins, Tocotrienol, Isoflavones, Catechin, Lycopene, Organic Sulphur Compounds and Simple Terpenes; Dietary Fibre and Amino Acid Based Derivatives; Designer Foods; Value Addition of Foods by Nutraceuticals; Pharma Food.

Unit-3: Probiotics, Prebiotics and Symbiotic

Probiotics: Concept, Human Gastrointestinal Tract and Its Microbiota, Classification of Pro Biotics, Role of Probiotics in Health and Diseases; **Prebiotics:** Oligosaccharides, Dietary Fiber, Resistant Starch, Gums, Spirulina as Bioactive Component; **Symbiotic**: Concept of Symbiotic Foods with Examples.

Unit-4: Functional Food and Food Fortification

Functional Food: Concept, Background, Health Benefits of Functional Foods, Usage of Functional Foods; Steps for the Development of Functional Food; **Fortified Food**: Development of Fortified Food, Physical, Chemical and Genetical Fortification- Vitamin-A Fortification and Iron Fortification.

Unit-5: Functional Foods and Food Groups

Role of Various Functional Foods from Different Food Groups: Cereals, Pulses, Milk and Milk Products, Fruit and Vegetables, Meat and Poultry, Sugar Products, Fats and Oils.

REFERENCES/ SUGGESTED READINGS

1. Gibson, G.R. and Williams, M.C. (2001). "Functional Foods: Concept to Product", CRC Press.
2. Wildma, R.E. (2016), "Handbook of Nutraceuticals and Functional Foods". CRC Press,
3. Yashwant Patak (2010), "Handbook of Nutraceuticals Volume I: Ingredients, Formulations and Applications", CRC Press.
4. Webb G.P (2016), "Dietary Supplements and Functional Foods", Blackwell Publishing Ltd, New York.
5. Tamine. A (2015), "Probiotic Dairy Products", Blackwell Publishing Ltd, United Kingdom.
6. USFDA Regulations on Functional Foods.
7. FSSAI Regulation of India.

MAJOR COURSE-17

COURSE NAME: NUTRITION ENTREPRENEURSHIP

COURSE CODE: BSCNUTMJ704

Course Type: Major (Theoretical)	Course Details: MJC-17			L-T-P: 4 - 1 - 0	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	…	**70**

Course learning Outcomes:

After the completion of the course, the students will have the ability to

- ***a)*** *Apply the knowledge and skills to establish and manage businesses in the nutrition and allied field.*
- ***b)*** *Develop networking for better marketing to establish the Entrepreneurship related Nutrition and allied field.*
- ***c)*** *Serve society and stakeholders with the benefits of the particular business set up.*

COURSE CONTENT

THEORY

Unit-1: Fundamentals of Entrepreneurship

Introduction to Conceptual Perspective of Entrepreneurship: Defining Entrepreneurship, Enterprise and Entrepreneur; Characteristics of Successful Entrepreneurs, Creativity, Innovation, and their Processes in Entrepreneurship.

Unit-2: Marketing Strategy and Entrepreneurship

Business Requirements for Food Product: Entrepreneur Needs, Government Requirements, Marketing, Developing the Business Plan, Determine the Resources, Business and Marketing Management Strategy; Business Marketing using Internet and AI.

Unit-3: Entrepreneurship Approaches

Entrepreneurship Development and Training: Approaches to Entrepreneurship Development, Selective Method, Shotgun Approach, Multiplier Method; Intervention as an Approach; Cottage and Small Scale Entrepreneurship; Women Entrepreneurship: Strength and Weakness and Opportunities in India; Development of Start-Up in the Field of Food Science and Nutrition.

Unit-4: Nutrition based Entrepreneurship

Different Types of Nutrition Based Entrepreneurship; Nutritious Food Service: Central and Cloud Kitchen Approaches, Nutritious Food Supplements; Nutraceutical Development and Supply; Delivery for Sale; Nutrition Health Consultation; Nutrition Education.

Unit-5: Entrepreneurship Advertising Skills

Merchandising Skills Especially for Entrepreneur: Know the Client, Responding To Requests, Pros and Cons of Yellow Pages Advertising, Client Feedback, Competition for Advertisement.

REFERENCES/ SUGGESTED READINGS

a) Khan, M.A. (1987): "Food Service Operations", Avi Publication Co.
b) Edward, K. (1997): "Food Service Facilities Planning" 3rd Ed, John Wiley & Sons.
c) Sethi, M. (2015): "Catering Management: An Integrated Approach", 3rd Ed. New Age International (P) Ltd.
d) Roday, S (2017): "Food Hygiene and Sanitation with Case Studies", 2nd Ed. McGraw Hill Education.
e) Harvard Business Review Press, 2017: "Entrepreneurial You: Monetize Your Expertise, Create Multiple Income Streams, and Thrive" by Dorie Clark.

MINOR COURSE-6

COURSE NAME: NUTRITION EDUCATION AND COMMUICATION

COURSE CODE: BSCNUTMN701

Course Type: Major (Theoretical)	**Course Details: MNC-6**			**L-T-P: 4 - 1 - 0**	
Credit: 5	Full Marks:100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**30**	…	**70**

Course learning Outcomes:

After the completion of the course, the students will have the ability to

a) *Utilize the available different communication tools for nutrition education and communication.*

b) *Identify the right method of communication, media and aid for conducting nutrition education and communication.*

c) *Expertise in organizing a nutrition education programme employing the audio visual aids.*

d) *Acquire appropriate skills in preparation of nutrition education and communication materials.*

COURSE CONTENT

THEORY

Unit-1: Fundamentals of Nutrition Education

Nutrition Education: Meaning, Nature and Importance of Nutrition Education; Method of Nutrition Education: Direct and Indirect Methods, Merits and Demerits of It.

Unit-2: Nutrition Education Programme

Organizing Programmes in Nutrition Education: Introduction, Selection of Theme, Planning, Execution, Surveillance, Monitoring and Evaluation of the Programme.

Unit-3: Nutrition Education Communication

Types, Process and Media of Nutrition Education Communication; Interpersonal, Group, Public and Mass Communication: Definition, Merits and Demerits, Types- Print Media, Newspaper, Magazine, Leaflets, Pamphlets, Radio, Television, Films.

Unit-4: Information, Education and Communication

Tools in Nutrition Education: Importance and Relevance of Information, Education, and Communication (IEC) in Nutrition and Public Health, Types, Advantages and Limitations, Design and Development of IEC Materials.

Unit-5: Rural Based Nutrition Education

Child to Child Approach, Women to Women Approach, Child to Parent Approach: Principle, Procedure, Advantages and Disadvantages.

REFERENCES/ SUGGESTED READINGS

1. Park K(2017): Textbook of Preventive and Social Medicine, 24th Ed. Banarsidas Bhanot Publishers.
2. Mahajan B. K, Roy R. N, Saha, I, Gupta, MC (2013):Text book of Preventive and Social Medicine, 4th Ed. Japee Brothers.
3. Pandya R (2010): Community Health Education, Rawat Publications.
4. Mishra L(2010): Adult Education, A study of the trials, APH Publishing Corporation, New Delhi
5. Khajuria D P: New Trends in Indian Education, Narendra Publishing House, Jalandhar.