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.
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8. Passmore R and Eastwood MA (1986): Davidson and Passmore's Human Nutrition & Dietetics, 8th Revised Ed. Churchill Livingstone.
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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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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.

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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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.

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 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 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.

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.