Learning Outcome based Curriculum Framework (LOCF)

For

Choice Based Credit System (CBCS)

Syllabus

B. Sc. (Honours) in Nutrition

w.e.f. Academic Session 2020-21

Kazi Nazrul University

Asansol, Paschim Bardhaman

West Bengal 713340

Introduction:

The Department of Nutrition Science offers Bachelor of Science (B.Sc.) Honours in Nutrition Science. The aim is to train a cadre of professionals who would work as dieticians, nutrition consultants and public health nutritionists. The programme is a three-year course divided into six-semesters. A student is required to complete 148 credits for the completion of course and the award of degree. A one week internship in a tertiary, multispecialty, minimum hundred bedded hospital with a Dietetics department is compulsory at the fifth semester of the course, for successful completion and for award of B.Sc. by the University.

Programme Specific Objectives:

1. Understand the role of food and nutrition for the welfare of the community.
2. Foundation for career opportunities in area of personal and Public Health Nutrition.
3. Enable to pursue higher education and research in academic and research institutions.
4. Promote entrepreneurs in the field of food and nutrition.
5. Inculcate the skill based knowledge on food industry.

Semester: I

Course Name: Community Nutrition and Epidemiology
Course Code: BSCHNUTC101

Course Type: **Core (Theoretical)**	Course Details: **CC-1**			L-T-P: **5 - 1 - 0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		…	**10**	……	**40**

Course Learning Outcomes:

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

1. *Acquire knowledge in epidemiological aspects*
2. *Become professionals in Public health Nutrition*
3. *Excel in assessment of nutritional status on the community*
4. *Develop comprehensive skills in public health nutrition*
5. *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 'L' test)
3. Nutritional assessment –different **anthropometric** measurement and interpretation, clinical signs, BM1, 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 intervension programmes-ICDS, Mid day meal programme, National prophyloxis.
6. Malnutrition-introduction, causes and prevention

Epidemiology

1 Epidemiology of nutrition related disease, study of epidemiological approaches, determinant of diseases, preventive and social means grindence & prevalence rate of disease.

2 Community of food protection, epidemiology of food borne disease-mode of transmission, control and prevention.

3 Community water and waste management: water borne infections agent, safe drinking water, potable water, waste and waste disposed. Sewage treatment, solid & liquid waste disposal.

4 Immunization-its importance, schedule for children, adult, Foreign traveler, pregnant mother vauination.

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.
3. Ritchie, JAS(1979): Learning Better Nutrition , Nutritional Studies number 20, FAO, Rome.
4. Gopaldas T and SeshadriS(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. BanarsidasBhanot 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. SeshubabuVVR(2011): Review in Community Medicine, 2nd Ed, Paras Medical Books Pvt Ltd.
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.

Course Name: Nutritional Biophysics and Biochemistry
Course Code: BSCHNUTC102

Course Type: **CORE (Theory & Practical)**	Course Details: **CC 2**			L-T-P: 4 - 0 - 4	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes:

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

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

Course Content:

Theory

Nutritional Biophysics

1. Introduction to Biophysics, interrelationship between Biophysics andnutrition
2. Cell membrane transport-passive diffusion, facilitated diffusion and active transport, Ion channels, symport, antiport transport system, osmosis: plasmolysis and deplasmolysis, colloid and surface tension
3. Principles of colorimetry, photometry, and Electrophoresis.
4. Acid, Base, Buffer, pH, and Acid-Basebalance.
5. Principles of thermodynamics and its importanceinnutrition.
6. Enzymes: Definition, types and classification: Coenzyme: definition and types, specificity of enzymes, isozymes, enzyme kinetics including factors affecting velocity of enzyme catalyze reactions, enzymeinhibition

Nutritional Biochemistry

Theory

1. Introduction to Biochemistry, Interrelationship between Biochemistry and Nutrition.
2. Intermediary metabolism.
    a. Carbohydrates: Glycolysis, TCA cycle and energy generation, Gluconeogenesis, Glycogenesis, Blood sugar regulation, Glycemicindex.
    b. Proteins: Classification, Structure in brief, Properties, Protein quality (BV, PER, NPU), Deamination, Transamination, Urea cycle, Elementary idea about protein synthesis.

c. Lypids: Classification, structure and properties, saturated and unsaturated fatty acids, their importances, β-oxidation of fatty acids, ω-oxidation, ketonebodies-generation, utilization, fatty liver.

3. Dietary fibres-classification, properties, nutritional significance.
4. Antioxidants, Nutraceuticals-preliminary idea, Natural source.
5. Lipoproteins-Types, comparition, role and significance indisease.
6. Nucleic acids: Structure, Replication, Transcription, Geneticcode.
7. Water metabolim & balance (inbrief).
8. Vitamins: water and fat soluble vitamins, pseudo vitamins, provitamins- definition and example.
9. Minerals: Biochemical role of Ca, Na, K, Fe, Se, I,Zn.

Nutritional Biophysics and Biochemistry

Practical

1. General qualitative tests for carbohydrates, reducing and nonreducing sugars, monosaccharides, aldoses and ketoses, disaccharidesandpolysaccharides.
2. Qualitative tests for simple proteins andderived proteins.
3. Qualitative tests for bile salts.
4. Qualitative tests for fat,glycerol, cholesterol.
5. Qualitative tests for detection of Ca, K, Fe, infood striffs.
6. Sequential tests for detection of an unknown nutrients. (Only from the above mentionednutrients)
7. Qualitative test for detection of saccharine, metanil yellow, kessin, banaspati in different food striffs starch in milk.
8. pH determination of solution using pH paper/pH meter, solution preparation of different normalitymolarity
9. Laboratory notebook
10. Viva-voce

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.
4. Devlin TM (2010): Text Book of Biochemistry with Clinical Correlations. John Wiley and Sons.
5. BergJM,Tymoczko JL, Gatto GJ and Stryer L(2015): Biochemistry, 8th Ed WH Freeman and Co.
6. Stryer. L. Biochemistry. Freeman W.H. and Co. 6. Assaini. J. Kaur. Text Book of Biochemistry. C.B.S. Publication.
7. U Satyanarayana, U Chakrapani. Text Book of Biochemistry. Books & Allied (P) Ltd.
8. Debojyoti Das. Biophysics & Biophysical Chemistry, Academic Publishers.

Course Name: Community Nutrition and Programmes

Course Code: BSCHNUTGE101

Course Type: **GE (Theory & Practical)**	Course Details: **GE1**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes:

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

1. *Gain knowledge on immunization process.*
2. *Define the concept of public health*
3. *Describe the functioning of public health nutrition programmes.*
4. *Acquire skills to handle nutrition monitoring protocols.*

Course Content:

Theory

1. Concept of Community, definition and types, factors affecting health and community.
2. Community health data-span and vital statistics of infants, child and maternal mortality.
3. Communicable disease: food borne diseases, water borne diseases,prevention, importance of food hygiene and water hygiene andprevention.
4. Non communicable diseases: diabetes, obesity, cardiovascular diseases-causesand dietaryprevention.
5. Concept of nutritional surveillance system and international, national and regional agencies organizations, Nutritional intervention programmes-ICDS, Mid-day meal programme, Nationalprophylaxis.
6. Immunization programme-Principle, child and mothersimmunization.
7. Growth chart analysis, Anthropometric assessment of nutritional status ofchild.

Practical

1. Growth chart preparation of preschool and School goingchildren.
2. Nutritional status assessment using height, weight, BMI.
3. Evaluation of mid day meal programme-Reportpreparation.
4. Problem solving on the basis data on vitalstatistics.
5. Immunization status report preparation on yoursociety.

References/ Suggested Readings:

1.B.Srilakshmi : Nutrition Science, New Age International Publishers
2. Guthrie, A.H.: Introductory Nutrition, 6th Ed. The C.V. Mosby Company
3. Robinson, C.H.Lawer, M.R.; CheiToweth, W.L. and Garwick, A.E.: Normal and Therapeutic Nutrition.17th Ed. Mac Milan Publishing Co.35
4. Swaminathan, M : Essentials of Foods and Nutrition, Vols-1and II. Ganesh and Co. Madras.
5. Ghosh, S.: The Feeding and Care of Infants arid Young Children, VHAI. 6th Ed. Delhi.
6. Mann and Truswell: Essentials of Human Nitration, Oxford University press.

Semester - II

Course Name: Food science and Food Commodities

Course Code: BSCHNUTC201

Course Type: **Core (Theoretical)**	Course Details: **CC-3**			L-T-P: **5-1-0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes:

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

1. *Gain knowledge on food groups, food pyramid and understand cooking methods with the application in balanced menu planning.*
2. *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.*
3. *Collect knowledge on nutritive value, understand the cooking quality factors and develop skills in the preparation and storage of milk and egg products.*
4. *Gather knowledge on the structure and nutritive value, understand the processing factors and acquire skills in processing and storage of flesh foods.*
5. *Gain skills to process and store cereals, pulses, nuts and oilseeds.*

Course Content:

Food Science

Theory

Basic concept of Food & Nutrition, Classification of Food & Nutrition, foodgroup.

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 & nutritionalsignification.
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. Food additives, type, impact on health.

Food commodities:

1. Cereals and Millets: cereals products, breakfast cereals, processing and storage.

2. Pulses and Legumes:- varieties, storage, processing, and use in different preparations, nutritional aspect.

3. Milk and milk products:- composition, classification, selection quality, processing storage and use in different preparations, nutritional aspect.

4. Fish, Meat and poultry (meat, egg)): types, selection, storage, uses, spoilage and its detection, nutritional aspect.

5. Vegetables and fossils: types, selection, storage, availability, nutritional aspect of raw and processes products and use in different preparations.

6. Fats and oils:- types and sources, processing(refining) uses in different p[reparation, storage, nutritional aspect.

7. Sugar ad sugar products:-types of natural structures, manufacture, storage and uses as preserver.

8. Basic of bakery and confectionary items, Bread, biscuit, cake, and Pastry-manufacturing and nutritional aspect.

9. Salt:- types and uses.
10. Beverages: tea, coffee, chocolate and cocoa-its nutritional significance, other beverages-aerated beverages-impaction health.

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 & Publishing Company.

10. SrilakshmiB(2018): Food Science, 7th Colour Ed. New Age International (P) Ltd.

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

Course Name: Nutritional Physiology

Course Code: BSCHNUTC202

Course Type: **Core (Theory & Practical)**	Course Details: **CC-4**			L-T-P: 4 - 0 - 4	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcome:

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

1. *Understand the Structure and Functions of the various organ systems of the body*
2. *Relate the Structure with 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

1. Structure & Function of Cells:- structure and function of plasma membrane, nucleus, mitochondria, Golgi bodies, endoplasmic reticulum, ribosome, lysosome.
2. Cardio vascular system- blood, composition of blood, function of blood, erythropoiesis, blood group, blood transformation & its hazards, coagulation of blood, heart-structure & function of heart, heart rate, cardiac cycle & cardiac output. Blood pressure & its controls, general course of bloodcirculation.
3. Gastro intestinal system:- structure & function of various organ of GI tract. Digestion and absorption of food. The role of enzymes & hormone on digestion andabsorption.
4. Excretory system:- structure & function of kidney & bladder, formation of urine. Role of kidney in homeostasis, structure & function of skin & body temperature control.
5. Respiratory system:- structure of respiratory system, mechanism of breathing &its control. Oxygen and Carbon-dioxide transport in blood. Vital capacity & other volumes.Acclimatization.
6. Nervous system:- Elementary amatory of narrow system, function of different parts of the brain in brief. Sympathetic & parasympathetic nervous system. Specialsenses.
7. Musculoskeletal system:- types of muscle, function & structure, skeletalsystem, formation of bone & teeth(generalidea).

8. Endocrine system:-structure & function, deficiency & excess symptoms, hypothalamus, pituitary, thyroid, parathyroid, pancreas, adrenal gland, array, testes, placenta, gastro-intestinal tart.
9. Immunology:- Cellular immunity, humeral immunity, active andpassive immunity, complementsystem.
10. Reproductive events:- Hormonal control of puberty, menstrual hesitationand menopause.

Practical

a) Quantification of Starch, Lactose, Sucrose in different foodstuff.
b) Quantification of total protein infood.
c) Quantification of calcium, Vitamin-C, Vitamin-A, infood.
d) Blood pressure measurement.
e) Qualitative assessment of glucose, blood, ketone bodies inurine.

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;

Course Name: Physiology and Nutritional Aspect of Food

Course Code: BSCHNUTGE201

Course Type: **GE (Theory & Practical)**	Course Details: GE-2			L-T-P: 4 - 0 - 4	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes:

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

1. *Acquire knowledge on applications of technology in food processing.*
2. *Define the basic concepts of human physiology*
3. *Describe the homeostasis mechanism in human body*
4. *Demonstrate the basic concepts of food chemistry*

Course Content:

Theory

Physiology and Nutritional aspect of food

1. Structure and functions of cells: Briefidea.
2. Gastric intestinal system: structure of various organs of GI tract, digestionand absorption offood.
3. Endocrine system: function, deficiency, and excess symptoms of differentendocrine organ (Thyroid, parathyroid, pancreas, adrenal). Concept of GIhormones.
4. Nervous system:- Elementary anatomy of nervous system, brief function of different components of brain sympathetic and parasympathetic nervous system and special senses.
5. Cardiovascular system: Blood-composition and function, group, transtrisium, and its hazards, coagulation. Heart: rate cardiac cycle and bloodpressure.
6. Carbohydrate, protein & Fat: Definition & properties, classification, dailyrequirement and their onhealth.
7. Mineral, vitamins & water:- sources, physiological function, deficiencysymptoms, watermetabolism.
8. Crewels & pulses:- type & nutritionalimportance.
9. Fish, meat, egg, & milk:- nutritionalimportance.
10. Vegetables, fruits-salts-Physiologicalimportance.
11. Be recycle: type, impact onhealth.
12. Food standards & food additives:- general concept.

Practical

GE-II (Lab)

Physiology and Nutritional aspect of food.

1. Determination of blood group and blood pressure.
2. Qualitative test of Glucose, Starch, Cholesterol, Urica cid.
3. Qualitative of common food additives- meanly yellos, Banaspati, Argemone oil.

References/ Suggested Readings:

1. Dowell, P. and Bailey A: The Book of Ingredients, Borling Kinderly ltd.London
2. Hugoes, O and Beninion. M: Introductory Foods, Mac Millan and Com. NewYork
3. Lavies S. Food commodities Ltd.London
4. Prevention of Food Adulteration Act: Govt. ofIndia.
5. Essential of Food & Nutrition by Swaminathon Vol-I &Vol-II
6. Food Chemistry by L. H. Muyer.
7. Chatterjee Chandi Charan: Text Book of Human Physiology Vol-I and Vol-II
8. Medical Physiology; A.CDev
9. Food Science: SriLakshmi

Semester - III

Course Name: Nutrition Programming and Emergency Nutrition Management

Course Code: BSCHNUTC301

Course Type: **CORE** (**Theoretical**)	Course Details: CC-5			L-T-P: 5 - 1 - 0	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes:

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

1. *Learn the nutritional assessment methods during disaster condition*
2. *Communicate the need of the nutrition programmes.*
3. *Analyze the logical flaws of present national nutrition programmes.*
4. *Develop problem solving skills during emergency/ disaster condition.*
5. *Acquire the skills to formulate team during emergency condition.*

Course Content:

Theory

Nutrition Programming:

1. Definition of Nutrition Programme- Program planning, steps adoptedfor formulation of Nutrition Programmes, Objectives of Nutritionprogramme.
2. Types of Nutrition Programme- Supplementary Nutrition Programmes, Applied Nutrition Programmes, Features of such Programmes and Applied value of such Programme.
3. 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, Objective of Evaluation and AppliedValues.

Emergency Nutrition Management:

1. Emergency/Disaster- Types, Nutritional disturbances in Emergency/Disaster conditions.
2. Disaster Management Cycle- Its different phases and theirimportance.
3. Packed food/Dry Food distribution of the immediate phase and Advantages of Dry Fooddistribution.
4. Common Kitchen concept for Nutritional Management and NutritionalRehabilitation.
5. Nutritional Management at Critical Care Unit- Concept of parenteral and Enteral Feeding for Nutritional Management. Monomeric and Polymeric types of Formulated Diet and General Features and Advantages..

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.

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 Valverde V(1984): Nutritional Surveillance, World Health Organisation.

6. Park K(2017): Textbook of Preventive and Social Medicine,24th Ed. anarsidasBhanot 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. SeshubabuVVR(2011): Review in Community Medicine, 2nd Ed, Paras Medical Books PvtLtd.

10. Mahajan BK, Roy RN , Saha I, Gupta, MC (2013):Text book of Preventive and Social Medicine, 4th Ed. Japee Brothers.

11. Vir SC(2011): Public Health Nutrition in Developing Countries, Woodhead Publishing India.

12. Bamji MS, Krishnaswamy K and BrahmamGNV(2017): Textbook of Human Nutrition , 4thEd. Oxford & IBH Publishing Co. Pvt. Ltd.

Course Name: Human Nutrition

Course Code: BSCHNUTC302

Course Type: **CORE** (**Theoretical**)	Course Details: CC-6			L-T-P: 5 - 1 - 0	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	**……**	**40**

Course Learning Outcomes:

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

1. *Define the term nutritional status.*
2. *Demonstrate the different methods of measurement of body composition method*
3. *Formulate dietary guidelines for the individuals.*
4. *Critically analyse the physiological determinants while formulating dietary guidelines*

Course Content:

Theory

1. Concept and Definition of Form Nutrition, Malnutrition and Health. Brief history of Nutritional Science and Scope of Nutrition.
2. Body Composition and its changes in Different phases of Life.
3. MinimumNutritionalrequirementandrecommendeddietaryallowances.ReferenceMan, Reference Woman
4. 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.
5. Energy and Nutritional Requirement of adult Male and Female engaged in different types of work (Sedentary, Moderate, and Heavy).

Growth and Development

a) Physical growth and development, different phase of life Embryonic, Infancy, School children and Adolescents, Growth spurt in Pubertal changes, Use of growth chart and standard Nutrition during infancy- Breast feeding and its Advantages & Disadvantages, Colostrum and its importance inFeeding.
b) Formula feeding, Supplementary foods and Digestive disturbances ofinfants.
c) Nutritional requirements of Toddlers, Pre-school children, School going children and Adolescents.

References/ Suggested Readings:

1. SrilakshmiB(2014): Dietetics, 7th Multicolour Ed. New Age International (P) Ltd.
2. Guthrie AH(1986):Introductory Nutrition, 6th Revised Ed., McGraw-Hill Inc., US.
3. Robinson CH and Lawler M(1990): Normal and Therapeutic Nutrition. 17th Revised Ed. Macmillan USA.
4. SwaminathanM(2007): Essentials of Food and Nutrition(Vol. I & II), 2nd Ed. Bappco
5. GopalanC , Rama Sastri BV and Balasubramanian SC(2016): Nutritive value of Indian Foods, Indian Council of Medical Research.
6. Nutrient Requirements and Recommended Dietary Allowance for Indians, Indian Council of Medical Research: New Delhi.
7. FAO/WHO/UNO: Technical Report Series, 724 (1985). Energy and Protein Requirement,Geneva.
8. GhoshS(2007):Nutrition and Child Care, 2nd Ed. Jaypee Brothers Medical Publishers Private Limited.
9. WHO : A growth chart for International use In Maternal and Children Health Care, Geneva.
10. Mann J and TruswellS(2017) : Essentials of Human Nutrition, 5th Ed. Oxford University Press.
11. Worthington- Roberts B and Williams SR(1999): Nutrition Throughout the Life Cycle , 4th Ed. McGraw-Hill Higher Education.
12. Elizabeth KE(2015); Nutrition and Child Development , 5th Ed. Paras Medical Publishers.
13. Geissler C and Powers H (2005):Human Nutrition, 11th Ed. Churchill Livingston.
14. Zimmermann M(2001):Burgerstein's Handbook of Nutrition: Micronutients in the Prevention and Therapy of Disease Thieme Stuttgart.
15. Samour PQ and King K(2010): Pediatric Nutrition, 4t Ed. Jones & Bartlett Learning.
16. Insel P, Ross D, McMahon K and Bernstein M(2016): Nutrition, 6th Ed. Jones & Bartlett Learning.
17. MudambiSR(2018): Fundamentals of Foods, Nutrition and Diet Therapy, 6th Ed. New Age International (P) Ltd.
18. Williams SR(2001): Basic Nutrition and Diet Therapy, 11th Ed. Elsevier.
19. Proudfit FT and Robinson CH(1967):Normal and Therapeutic Nutrition, 13th Ed. Mamillan.
20. Guthrie H and Picciano MF (1994): Human Nutrition , WCB McGraw-Hill,
21. Smith A and ColleneA(2015); Wardlaw's Contemporary Nutrition, 10th Ed. McGraw-Hill Education.
22. Sharlin J and Edelstein S(2010): Essentials of Life Cycle Nutrition, 1st Ed. Jones & Bartlett Learning.
23. Indian National Code for Protection of Breast Feeding: Govt. of India. Ministry of Social Welfare, New Delhi.

Course Name: Diet Therapy - Fundamental

Course Code: BSCHNUTC303

Course Type: **CORE** **(Theory & Practical)**	Course Details: CC-7			L-T-P: 4 - 0 - 4	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

***Course Learning Outcomes**:*

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

1. *Translate theoretical knowledge in the practical context.*
2. *Define the terminologies associated with therapeutic diets.*
3. *Demonstrate the working principles of different food groups.*
4. *Conceptualize the food exchange system*

Course Content:

Theory

1. Basic concepts of Therapy: Modification of normal diet to therapeutic diet, its principal and classification.
2. Food Groups: Cereals, pulses, milk and meat product, fruits and vegetables, fats and sugars, Food composition table.
3. Food Exchange list system: Diet Counselling and its advantages, Basic principles for preparation of diet. Balanced Diet, Formulation of Diet chart, Principle of Energy distribution in different meal/day. Diet in infancy, pre-school going children and Adolescents. Principles and steps in planning menu.
4. Vegetarian Aid: Socio-cultural and regional food habits in different age groups.

References/ Suggested Readings:

1. Anderson, L., Dibble, M.V., tukki, P.R., Mitchall, H.S., and Rynbergin H.J.: Nutrition in Health and Disease, 17th edition, J. B. Lipincott& Co. Philadelphia.
2. Antia F. P.: Clinical Dietetics and Nutrition, Second Edition, Oxford University Press, Delhi.
3. Mahan, L. K., Arlin, M. T.: Krause's Food, Nutrition and Diet Therapy. 8th edition, W. B. Saunders Company, London.
4. Robinson. C.H. Lawler, M.R. Chenoweth, W. L., and Garwick, A. E. (1986): Normal and Therapeutic Nutrition. 17th edition, MacMilian Publishing Co.
5. Williams. S. R.: Nutrition & Diet Therapy, 6th edition, Times Mirror/Mosby College Publishings, St. Louis.
6. Raheena, Begum: A textbook of food, nutrition and dietetics Sterling Publishers, New Delhi.
7. Joshi, S. A.: Nutrition and Dietetics, Tata McGraw Hill, Publications, New Delhi

Diet Theory- Fundamental
Lab Core Course-VII
(Practical)

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,etc.

2. Requirement of Carbohydrate, Protein, Fat on the basis of energycalculation.

3. Energy distribution in Breakfast, Lunch and Dinner, Menu-planning and Nutritional Analysis.

4. Balance Sheet preparation in differentmeal.

Course Name: Nutrition Programming

Course Code: BSCHNUTGE301

Course Type: **GE** **(Theory & Practical)**	Course Details: **GE-3**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes:

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

1. *Acquire knowledge of basics of diet therapy*
2. *Define the concept of nutrition programs*
3. *Describe the steps of planning a nutrition programs*
4. *Demonstrate the assessment protocols of growth and development*

Course Content

Theory

Definition types, Steps adopted for formulation of Nutrition programmes, Objectives, Applied values of such programmes.

Emergency Nutrition Management

1. Energy in Human Nutrition : Energy requirement of the body, BMR, Factors affecting measurement of BMR, Specific Dynamic Action (SDA) and Calorific value of Food. Energy and Nutritional requirement of adult male and female engaged in different kinds of work (sedentary, moderate andheavy).
2. Basic concepts of Diet Therapy: Modification of normal diet to therapeutic diet, its principle and classification, Formulation of diet chart, Principle of energy distribution in different meal perday.

Semester III General
Elective III (Lab)

1. Computation of energy requirement of an individual per day on the basis of BMR and physical activity.
2. Preparation of low-cost and middle cost school tiffin (ingredients are to besupplied)

References/ Suggested Readings:

1. Jelliffe, D. B.: Assessment of the Nutritional Status of the Community; World Health Organisation.
2. Sain, D. R. Lockwood, R., Scrimshaw, N. S.: Methods the Evaluation of the Impact of Food and Nutrition Programmes, United Nations University.
3. Ritchie, J.A.S. : Learning Bettor Nutrition FAO, Rome.
4. Gopalon. C. : Nutrition Foundation of India, Special Publication service.
5. Beghin, 1. Cap. M: Dujardan. B. : A Guide to Nutrition Status Assessment. W.H.O. Geneva. 6. Gopaldas, t. Seshadri, S. : Nutrition Monitoring a Assessment: Oxford University Press.
7. Mason, J. B., Habicht, J. P.; Tabatabai. H. Valverde. U.: Nutritional Surveillance, W.H.O.

Course Name: Child Development Skills

Course Code: BSCHNUTSE301

Course Type: **SEC** **(Theoretical)**	Course Details: **SEC-1**			L-T-P: 4-0-0	
Credit: **4**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

Course Learning Outcomes:

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

1. *Define the developmental stages of a child.*
2. *Describe the steps of language development.*
3. *Demonstrate need of social development.*
4. *Analyze the problems associated with the developmental failures.*

Course Content:

Theory

UNIT I: Introduction to child development- Meaning and importance of child development, need for studying child development, factor influencing child development, aspect of development, characteristics of various stages of child development, expected development tasks of childhood.

UNIT II: Physical and motor development: Factors affecting physical development, hazards in physical development, gross motor and fine motor development, principals of motor development.

UNIT III: Intelligence and cognitive development-Concept of intelligence, factors influencing intelligence, language development and stages of language development, cognitive development, components and stages of cognitive development (Piaget's theory), factors influencing cognitive development.

UNIT IV: Social and emotional development- Concept of social development, stages in social development, Characteristics of children's emotion, important childhood emotions

References/ Suggested Readings:

1. Berger JM (2010): Personality, 8th Ed. Thomson-Wadswort: Berger Belmont, CA.
2. Allen BP (2006): Personality theories: Development, growth and diversity , 5th Ed. Pearson Education / Allyn& Bacon.
3. Santrock JW(2007): Lifespan Development, 3rd Ed. Tata- McGraw Hill, New Delhi.
4. Rice FP(1995): Human Development: A Lifespan Approach. New Jersey, Prentice-Hall
5. Chopra G (2012): Early Detection of Disabilities and persons with disabilities in the community, Engage publications , New Delhi.
6. Chopra G (2012): Stimulating Development of Young Children with Disabilities At Anganwadi and at Home: A Practical Guide, Engage publications,New Delhi.

Course Name: Home Management Skills

Course Code: BSCHNUTSE302

Course Type: **SEC** **(Theoretical)**	Course Details: **SEC-1**			L-T-P: 4-0-0	
Credit: **4**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		……	**10**	……	**40**

***Course Learning Outcomes*:**

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

1. Develop management skills
2. Reflect the need of family values in a developed society.
3. Motivate people to have right attitudes for success.
4. Develop new skills for managing space, time and work.

Course Content:
Theory

UNIT I: Introduction to Home Management- Concept of home management, process of home management, process of planning, controlling and evaluation in home management.
UNIT II: Motivating factors of management – Concept of values, attitudes, standards and goals in management, role of my family, cycle.
UNIT III: Family recourses and management- Types of recourses, characteristics of recourses, classification of recourses, management of time and energy, alignment of body parts, importance of space management.
UNIT IV: Work simplification- Concept of work simplification, modes of work simplification, techniques of work simplification (Mundal's model)

***References/ Suggested Readings*:**

1. Elective Course For Bsc. Home Science (Honours) -Dr. Sangita Gupta, Dr. Mithilesh Verma, Dr. Smita Tripathi Dr.Neelma Kunwar and Kumari Amisha
2. Mental Health Care for Elderly People, 1e – Ian J. Norman
3. Health Behavior Change: A Guide for Practitioners – Stephen Rollnick
4. Fundamentals of Human Nutrition E-Book: for Students and Practitioners in the Health Sciences – Catherine Geissler and Hilary Powers
5. Introduction to Health and Safety in Construction (Black & White Version): The handbook for construction professionals and students on NEBOSH and other construction courses – N.S. Nahar and S. Bhatnagar

6. Nutritional Sciences: From Fundamentals to Food -Michelle McGuire and Kathy A Beerman
7. Conservation of Building and Decorative Stone (Butterworth-Heinemann Series in Conservation and Museology) – F G Dimes and J. Ashurst
8. Public Health and Health Promotion: Developing Practice – Jennie Naidoo
9. UGC NET/JRF Exam – Solved Papers Home Science – Pratiyogita Darpan
10. UGC NET/JRF/SET Home Science (Paper II & III) – Akanksha

Semester - IV

Course Name: Food Microbiology

Course Code: BSCHNUTC401

Course Type: **CORE** **(Theory & Practical)**	Course Details: **CC-8**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes:

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

1. *Define the concepts of food microbiology*
2. *Advocate the importance of sanitation & hygiene*
3. *Analyze the quality of food sample*
4. *Formulate the appropriate research question.*

Course Content:

Theory

1. Introduction about food microbiology and importance of microorganisms in food science covering beneficial and harmful role.
2. Primary sources of microbial contamination of food.
3. Cultivation of microorganism, nutrition requirement covering different media.Bacterial growth-extrinsic and intrinsic factors. Control of bacterial growth-use of high and low temperature, dehydration, freezing, Irradiation, Sterilization and disinfection.
4. Food Spoilage–Contamination of microorganism in the spoilage of cereal and cereal products, vegetable and fruits, fish and other seafood, meat and meat products, egg and poultry, milk and milk products, canned foods.
5. Importance of sanitation and hygiene in foods, kitchen hygiene, employee health, food plant hygiene, food laws.
6. Bacterial Food Infections Salmonellosis, Shigellosis and Listeriozes, Fodpoisoning (Staphylococcal and Botulin) Symptoms, Mode of transmission and methods of prevention. Concept of afflatoxin, Intoxication.

Practical

Food Microbiology–Practical Core Course–VIII

1. Preparation of liquid (Broth) and solid media,Slant and Stab.
2. Pure culture of microbiological techniques-spread plate, pourplate and streak plate.
3. Staining of microorganisms–simple stain, differential stain (grammain).
4. Biochemical tests for characterization–catalase, indole formation, Nitrate-reduction, sugar fermentation test.
5. Microbiologicalexaminationofmilk–Methylenebluereductiontest.

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 & Technology, Vol I &Vol II , Educational Publishers & Distributors.
9. Tortora GJ, FunkeBR and Case CL(2016): Mocrobiology, 11th Ed. Pearson Education India.
10. Black JG (2008): Microbiology: Principles and Explorations, 7th Ed. John Wiley &

Course Name: **Diet Therapy-Physiological States**

Course Code: BSCHNUTC402

Course Type: **CORE** **(Theory & Practical)**	Course Details: **CC-9**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	20	**40**

Course Learning Outcomes:

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

1. *Develop dietary guidelines for different stages of life cycle.*
2. *Critically formulate the dietary guidelines based on economical context.*
3. *Advocate the need of the supplementary foods.*
4. *Demonstrate different forms of diet.*

Course Content:

Theory

1. General concept of Diet Therapy–Energy computation on work pattern, Macronutrients allocation on the basis of daily energy requirements. Micronutrients allocation–their importance in different phases of life cycle.
2. Classification of Diet–Energy rich, low, carbohydrate high, low, protein high, low, fat high, low, fibre high, low, Na-high, low, Routine diet, soft diet, Fluid diet, etc.
3. Planning and preparation of income dependent diet formulation for different phases of life cycle of human–Infant, pre-schoolchildren, school going children, college students, adult, geriatric person, pregnant and lactating mother, sports person.
4. Supplementary food–Types, importance at different phases of life cycle. Indication of supply of supplementary food with special reference to vulnerable group. General idea aboutF-75, F-100 supplementary diet.

Practical (Core Course –IX)

Diet Therapy – Physiological States

1. Planning and preparation of meals for different age group–pre-schoolchildren, school going children, adolescence, pregnant, lactating mother, geriatric person.
2. Diet/Meal preparation for different workers-Light, moderate and heavy workload.
3. Diet formulation one economical levels–low cost, moderate cost and high cost diet.
4. General idea about veg and non-veg diet formulation on same energy level.

References/ Suggested Readings:

1.Anderson L, Dibble MV, Turkki PR, Mitchall HS, and Rynbergin HJ(1983): Nutrition in Health and Disease, 17th Ed. J. B. Lipincott& Co. Philadelphia.

2.Anita FP and Abraham P: Clinical Dietetics and Nutrition, 4th Ed. Oxford University Press,Delhi.

3.Mahan LK and Escott-Stump S(2007): Krause's Food and Nutrition Therapy. 12th Ed. WB Saunders Company, London.

4.Robinson. CH, Lawler MR, Chenoweth WL and Garwick, AE(1986): Normal and Therapeutic Nutrition. 17th Ed.,Macmilian Publishing Co.

5.Williams SR (1989): Nutrition & Diet Therapy, 6th Ed. Times Mirror/Mosby College Publishing, St. Louis.

6.Begum RM (2009): A textbook of Food, Nutrition and Dietetics, 3rd Ed. Sterling Publishers,New Delhi.

7.Joshi SA(2017): Nutrition and Dietetics, 4th Ed. Tata McGraw Hill Publications, New Delhi.

8.Hutchison, R(2010)Food And The Principles Of Dietetics , Kessinger Publishing, LLC.

Course Name: Food Preservation and Processing

Course Code: BSCHNUTC403

Course Type: **CORE** **(Theory & Practical)**	Course Details: **CC-10**		**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	20	**40**

Course Learning Objectives:

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

1. *Define the different food preservation process.*
2. *Collaborate with the experts to develop new approaches for food preservation.*
3. *Describe the adverse effects of adulteration.*
4. *Analyze the necessary steps for establishing food processing units.*

Course Content:

Theory

1. General concept of food preservation–Importance of food preservation, limitation of food preservation.
2. Physical and Chemical methods of food preservation, activity in food preservation–role of water, Role of sugar, chemicals, sundryings and dehydration, Refrigeration and freezing – mechanism involved.
3. Some preserved foods–Jam, Jellies, Pickles, Syrup, Squashes–their composition, manufacture, use and nutritional aspects.
4. General concept of food processing–Food fermentation, Curd, Idle, Dhosa etc. Their nutritional importance.
5. Industrial processing of oil,milk,Vanaspati, Vinegar,Vit B12 and citric acid– food fortification.
6. Food adulteration types, impact, health disorders–controlling measures.

Practical (Core Course–X)

Food Preservation and Food Processing

1. Efficacy testing of the method of Food preservation by bacterial load assessment per field in different duration dependant sample.
2. PreparationofJamandJellies.
3. Visittofoodindustryandreportpreparationonfoodprocessingandpackaging preservation, plant sanitation and hygiene.

***References/ Suggested Readings*:**

1. Subalakshmi, G and Udipi, SA(2006):Food processing and preservation, 1st Ed. New Age International (P)Ltd.
2. SrilakshmiB(2018): Food Science, 7th Colour Ed. New Age International (P) Lt
3. Potter NN and Hotchkiss JH(1999): Food science,5th Ed , Spinger.
4. Srivastava RPO and Kumar S (2014): Fruit and Vegetable Preservation Principles and Practices, 3rd Ed. International Book distribution Company.
5. McWilliamsM and Paine H(1984): Modern Food preservation. Surjeet Publications,.
6. CruessWV(2004):Commercial Fruits and Vegetable Products, Agrobios India.
7. Desrosier NW and Desrosier JN(2006):The Technology Of Food Preservation, 4th Ed. CBS Publishers and Distributors, New Delhi.
8. Adams M and NoutMJR(2001): Fermentation and Food Safety, Spinger.

Course Name: Food Microbiology, Preservation and Processing

Course Code: BSCHNUTGE401

Course Type: **GE (Theoretical)**	Course Details: **GE-4**			**L-T-P: 5 - 1 - 0**	
Credit: **6**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
			10		**40**

Course Learning Outcomes:

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

1. Gain knowledge on applications of food microbiology
2. Define the basic concepts of food microbiology
3. Describe the morphological characteristics of microbes
4. Acquire basic skills to preserve food.

Course Content

Theory

Food microbiology, preservation and processing

1. Basic idea on Food microbiology–food spoilage, food intoxication, beneficial and harmful role of Microbes in food science.
2. General concept of food preservation on–sugar, dehydration, low temperature mediated processes.
3. Food processing–nutritional aspect of processed food,food fortification, food adulteration.

GENERIC ELECTIVE (GE)-Tutorial - IV

1. Extensive idea and group discussion/Seminar/Presentation
    a. Foodmicrobiology
    b. Foodprocessing
    c. Foodpreservation

References/ Suggested Books:

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 in General 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.

Course Name: Nutrient Analysis Quantitative: Vitamin & Minerals

Course Code: BSCHNUTSE401

<table>
<tr><td>Course Type: SEC
(Practical)</td><td colspan="2">Course Details: SEC-2</td><td colspan="2">L-T-P: 0 - 0 - 8</td></tr>
<tr><td rowspan="3">Credit: 4</td><td rowspan="3">Full Marks:
50</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practical</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>30</td><td></td><td>20</td><td></td></tr>
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Course Learning Outcomes:

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

1. Describe the concept of food composition table.
2. Demonstrate the various techniques of anthropometric measurements.
3. Analyze the large sample data.
4. Collaborate with the local stake holders.

Course Content:

Practical

1. NutrientAnalysisQuantitative(Vitamin/Minerals)

   Nutrient analysis of different food items covering vitamins, macro and micro minerals using standard food analysis table

References/ Suggested Readings:

1. Indian Food Composition Table (2017). National Institute of Nutrition, ICMR, Hyderabad.
2. Nutritive Value of Indian Food (2011). National Institute of Nutrition, ICMR, Hyderabad.

Course Name: Growth Assessment of School Going Children: Primary Level

Course Code: BSCHNUTSE402

Course Type: **SEC (Practical)**	Course Details: **SEC-2**			**L-T-P: 0 - 0 - 8**	
Credit: **4**	Full Marks: **50**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30		**20**	

Course Learning Outcomes:

After studying the paper the student will be able to

1. Describe the concept of food composition table.
2. Demonstrate the various techniques of anthropometric measurements.
3. Analyze the large sample data.
4. Collaborate with the local stake holders.

Course Content

Practical

Growth assessment of school going children (Primary School Level)
Weight/age using growth chart,height/age,weight/height and score, BMI, Body surface area,of school going children.

References/ Suggested Readings:

1. Smith, G.W.: Preventive Medicine and public health. 2nd edition. McMillan Co. New York.
2. Park: Park's Textbook of preventive and Social Medicine. 9th edition.M/s. BanarasidasBhanot.Jabalpur.
3. SeshubabuVVR(2011): Review in Community Medicine, 2nd Ed, Paras Medical Books Pvt Ltd.
4. Mahajan BK, Roy RN , Saha I, Gupta, MC (2013):Text book of Preventive and Social Medicine, 4th Ed. Japee Brothers.
5. Vir SC(2011): Public Health Nutrition in Developing Countries, Woodhead Publishing India.
6. Willett W(2012): Nutritional Epidemiology, 3rd Ed. Oxford University Press,USA.

Semester -V

Course Name: Diet Therapy - Non Communicable Diseases

Course Code: BSCHNUTC501

Course Type: **CORE** **(Theory & Practical)**	Course Details: **CC-11**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Objectives:

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

1. Gain knowledge on the etiological factors and complications, assessment parameters and dietary modifications in obesity and underweight
2. Understand the concept, purpose and principles of diet therapy and role and types of dietitians
3. Learn about the causes, types, biochemical changes, diagnostic tests, glycemic index, acute and chronic complications and dietary management of diabetes mellitus
4. Enumerate on the etiology, complications and dietary modifications of various cardiovascular diseases
5. Delineate various deficiency disorders with respect to their prevalence, causes, symptoms and preventive measures

Course Content:

Theory

1. General rules for modification of normal diet to therapeutic diet-principles.
2. Therapeutic diet of Diabetic patient:-
   Classification of Diabetes mellitus ethology, symptoms, diagnosis, glucose monitoring, Insulin therapy, oral hypoglycemic drug, Dietary management of obese & non obese diegetic patient- Artificial natural sweeteners, sugar substitute.
3. Therapeutic diet of cardiovascular diseases Atherosclerosis hyperlipidemia- ethology, risk factor, signs & symptoms, diagnosis & dietary management
4. Renal disease- classification, ethology, signs& symptoms Dietary management of glomerulonephritis, Uremia, Renal stone
5. Obesity & Stress Management by diet therapy- Ethology of obesity, classification, Dietary management. Stress- causative factors, Health disorders, Dietary management.

Practical

Core Course-XI (Practical)
Therapy Non- communicable Diseases lab

1. Diet chart preparation of diabetic patient, (Core specific).
2. Formulation of therapeutic diet on different cardio vascular diseases.
3. Planning of therapeutic diet on renal diseases.
4. Diet formulation for the management of obesity and stress.

References/ Suggested Readings

1.Anderson L, Dibble MV, Turkki PR, Mitchall HS, and Rynbergin HJ(1983): Nutrition in Health and Disease, 17th Ed. J. B. Lipincott& Co. Philadelphia.

2.Anita FP and Abraham P: Clinical Dietetics and Nutrition, 4th Ed. Oxford University Press, Delhi.

3.Mahan LK and Escott-Stump S(2007): Krause's Food and Nutrition Therapy. 12th Ed. WB Saunders Company, London.

4.Robinson. CH, Lawler MR, Chenoweth WL and Garwick, AE(1986): Normal and Therapeutic Nutrition. 17th Ed.,Macmilian Publishing Co.

5.Williams SR (1989): Nutrition & Diet Therapy, 6th Ed. Times Mirror/Mosby College Publishing, St. Louis.

6.Begum RM (2009): A textbook of Food, Nutrition and Dietetics, 3rd Ed. Sterling Publishers, New Delhi.

7.Joshi SA(2017): Nutrition and Dietetics, 4th Ed. Tata McGraw Hill Publications, New Delhi.

8.Hutchison, R(2010)Food And The Principles Of Dietetics , Kessinger Publishing, LLC.

Course Name: Research Methodology

Course Code: BSCHNUTC502

Course Type: **CORE** **(Theory & Practical)**	Course Details: **CC-12**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	20	**40**

Course Learning Objectives:

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

1. *Acquire problem solving quality.*
2. *Acquire analytical quality.*
3. *Collaborate with the different stakeholders.*
4. *Demonstrate the designing the of research methodology.*

Course Content:

Theory

1. General concept of research methodology, its importance for research designing. General idea about- Data, Information &Intelligence.
2. General idea about Basic, applied and action research with examples- objectives, interrelationships, limitation.
3. Hypothesis- Types, Importance of hypothesis. 4. Literature Review- Sources, importance's, and impact on project formulation.
5. Fundamentals steps adopted for projectformulation.
6. General concept of Experimental designing.

Practical

Core Course–XII
Research Methodology (Practical)
Research Methodology Review

1. Review writing as per standard protocol in the field of recent domains of nutritional research and submission under the guidance of your teachers as per allotment by the concerndepartment.

References/ Suggested Readings:

1. Best, JW and Kahn, JV (1992) Research in Education.6th ed. New Delhi, Prentice Hall of India Pvt. Ltd,
2. Kothari, CR (2004) Research Methodology, Methods & Techniques, 2nded. New Age International Publishers.
3. Goode, WJ and Hatt, PK (1981) Methods in Social Research, McGraw Hill International Editions, Sociology Series.
4. Kerlinger, FN (1983) Foundations of Educational Research. 2nd ed.
5. Marjory L. Joseph, William D Joseph (1996) Research Fundamentals in Home Economics / Human Ecology. Plycon Press.
6. WHO (2001) Health Research Methodology – A Guide for Training in Research Methods.
7. Gilbert N. (1981). Statistics. 2nd ed. CBS College Publishing. Japan
8. Moser CA, Kalton G (1979). Survey methods in social investigation. 2nd ed. Heinemann Educational Books Ltd. London.

Course Name: Internship

Course Code: BSCNUTDSE501

Course Type: **DSE (Practical)**	Course Details: **DSEC-1 or DSEC-2**			**L-T-P: 0-0-12**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60		40	

Course Learning Outcomes

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

1. *Gain knowledge from bed side teaching.*
2. *Formulate Hospital based diet.*
3. *Provide dietary counseling.*
4. *Work as support system of a medical unit.*

Course Content:

Practical

Internship- In any Hospital for therapeutic diet analysis at least for 7 days. ReportPreparation under the guidance of your Mentor as allotted by the concerned Department.(Theory)

Internship (Practical):- Audio-visual presentation of your data oninternship.

References/ Suggested Readings

1.Anderson L, Dibble MV, Turkki PR, Mitchall HS, and Rynbergin HJ(1983): Nutrition in Health and Disease, 17th Ed. J. B. Lipincott& Co. Philadelphia.
2.Anita FP and Abraham P: Clinical Dietetics and Nutrition, 4th Ed. Oxford University Press, Delhi.
3.Mahan LK and Escott-Stump S(2007): Krause's Food and Nutrition Therapy. 12th Ed. WB Saunders Company, London.
4.Robinson. CH, Lawler MR, Chenoweth WL and Garwick, AE(1986): Normal and Therapeutic
Nutrition. 17th Ed.,Macmilian Publishing Co.
5.Williams SR (1989): Nutrition & Diet Therapy, 6th Ed. Times Mirror/Mosby College Publishing, St. Louis.
6.Begum RM (2009): A textbook of Food, Nutrition and Dietetics, 3rd Ed. Sterling Publishers, New Delhi.
7.Joshi SA(2017): Nutrition and Dietetics, 4th Ed. Tata McGraw Hill Publications, New Delhi.
8.Hutchison, R(2010)Food And The Principles Of Dietetics , Kessinger Publishing, LLC.

Course Name: Child Immunization

Course Code: BSCHNUTDSE502

Course Type: **DSE (Theory & Practical)**	Course Details: **DSEC-1 or DSEC-2**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes:

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

1. *Gain the knowledge of scientific reasoning.*
2. *Define the concept of immunization.*
3. *Describe the importance of hygiene.*
4. *Reflect new research problem in child development.*

Course Content:

Theory

Child Immunization:- General concept of Immunization Vaccination, Taper of vaccination. Triple vaccine, concept of booster dose. Universal Immunization schedule. Primary & secondary reaction vaccination. Memory cellformation.

Practical

DSE-II (Lab)

Assignment programme conductor and report writing child immolation by surveytechnique through questionnaire method and submission of report.

References/ Suggested Readings

1. Winword (1988): Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.
2. Chatterjee CC (1988). Text Book of Physiology – Vol I & II.
3. Chaudhuri SK (2000). Concise Medical Physiology. New Central Book Agency(P) Ltd.
4. Guyton AC, Hall JE (2012). Text book of Medical Physiology. 9th Ed. Prism Books (Pvt.) Ltd. Bangalore
5. Guyton AC (2003). Function of the Human Body, 4th Edition, W.B. Sanders Company, Philadelphia.
6. Hadley ME (2000). Endocrinology. 5th ed. Pearson Education.
7. Hoar WS (1984). General and comparative Physiology. 3rd ed. Prentice-Hall of India.
8. Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.

Course Name: Child Hygiene

Course Code: BSCHNUTDSE503

Course Type: **DSE (Theory & Practical)**	Course Details: **DSEC-1 or DSEC-2**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes:

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

1. Gain the knowledge of scientific reasoning.
2. Define the concept of immunization.
3. Describe the importance of hygiene.
4. Reflect new research problem in child development.

Course Content:

Theory

Child Hygiene: - General concept of child hygiene. Factors affection child hygiene. Child hygiene by women to women strategy. Food hygiene, Cloth hygiene, Habited on childhealth.

Practical

Or (Lab)

A. Assignment programme conductor and report writing child hygiene by surveytechnique through questionnaire method and submission ofreport.

References/ Suggested Readings

1. Chatterjee CC (1988). Text Book of Physiology – Vol I & II.
2. Chaudhuri 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 Books (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,1st Ed.Taylor&Francis

Semester- VI

Course Name: Diet Therapy-Communicable Disease

Course Code: BSCHNUTC601

Course Type: **CORE** **(Theory & Practical)**	Course Details: **CC-13**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

***Course Learning Outcomes*:**

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

1. *Define the concept of communicable disease.*
2. *Demonstrate the nutritional management protocol for communicable diseases.*
3. *Describe the concept of HIV/AIDS*
4. *Learn problem solving capacity in an integrated manner.*

Course Content:

Theory

1. Gastro-Intestinal Communicable Disease-Diarrhea, Cholera-Ethology, Pathophysiology, symptoms, Dietary management of diarrhea and cholera patients.
2. Communicable Hepatic Disease: Jaundice, Hepatitic Factors, Pathophysiology, symptoms, Dietary management of Jaundice &Hepatitis
3. Malaria: Types, Factors, symptoms, Dietary management.
4. Immune deficiency viral related Disease: HIV, Etiology, symptoms, Diagnosis Dietary management of HIV sero positive individuals.

Practical

Core Course-XIII
Practical-Diet Therapy-Communicable Disease

1. Diet Formulation of the patient suffering from diarrhoea,Cholera
2. Formulation of diet of Jaundice and Hepatitispatient.
3. Principle of therapeutic diet and its formulation of Maleria affectedpatients.
4. Diet formulation of HIV positiveindividual.

References/ Suggested Readings:

1. Anderson L, Dibble MV, Turkki PR, Mitchall HS, and Rynbergin HJ(1983): Nutrition in Health and Disease, 17th Ed. J. B. Lipincott& Co. Philadelphia.

2. Anita FP and Abraham P: Clinical Dietetics and Nutrition, 4th Ed. Oxford University Press,Delhi.

3. Mahan LK and Escott-Stump S(2007): Krause's Food and Nutrition Therapy. 12th Ed. WB Saunders Company, London.

4. Robinson. CH, Lawler MR, Chenoweth WL and Garwick, AE(1986): Normal and Therapeutic Nutrition. 17th Ed.,Macmilian Publishing Co.

5. Williams SR (1989): Nutrition & Diet Therapy, 6th Ed. Times Mirror/Mosby College Publishing, St. Louis.

6. Begum RM (2009): A textbook of Food, Nutrition and Dietetics, 3rd Ed. Sterling Publishers, New Delhi.
7. Joshi SA(2017): Nutrition and Dietetics, 4th Ed. Tata McGraw Hill Publications, New Delhi.
8. Hutchison, R(2010)Food And The Principles Of Dietetics , Kessinger Publishing, LLC.

Course Name: Health Statistics

Course Code: BSCHNUTC602

<table>
<tr><td>Course Type: CORE
(Theory & Practical)</td><td colspan="2">Course Details: CC-14</td><td colspan="2">L-T-P: 4 - 0 - 4</td></tr>
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100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practical</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>30</td><td>10</td><td>20</td><td>40</td></tr>
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Course Learning Outcomes:

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

1. *Gain the knowledge in applications statistical tests.*
2. *Define the concept of statistics*
3. *Describe the application of statistics in health research*
4. *Analyze the data using statistical tools.*

***Course Content*:**

Theory

1. Fundamentals about data presentation-Grouped ungrouped data, Bar diagram, Pie diagram, Histogram, Frequency distribution, Frequency polygon, Ogive, Normal distribution, Skewness kurtosis.
2. Central Tendency: Concept of Mean, Median & Mode. Computation of Mean from grouped and ungrouped data.
3. Standard deviation & StandardErrors.
4. Test of significance: One tail and two tail ‘t’ tests-single group paired observation, Independent groups, Comparative analysis with population mean or reference value. Chi squaretest

Practical

Health Statistics Lab

1. Presentation of data in groupedmanner.
2. Graphical presentation of data in Histogram, Bar diagram, Pie diagram and Ogive.
3. Computation of central tendency of the supplieddata.
4. Analysis of test of significans by conducting students ‘t’test.
5. Test of significance analysis of nonparametric data by Chi squaretest.

References/ Suggested Readings

1. Best, JW and Kahn, JV (1992) Research in Education.6th ed. New Delhi, Prentice Hall of India Pvt. Ltd,

2. Kothari, CR (2004) Research Methodology, Methods & Techniques, 2nded. New Age International Publishers.

3. Goode, WJ and Hatt, PK (1981) Methods in Social Research, McGraw Hill International Editions, Sociology Series.

4. Kerlinger, FN (1983) Foundations of Educational Research. 2nd ed.

5. Marjory L. Joseph, William D Joseph (1996) Research Fundamentals in Home Economics / Human Ecology. Plycon Press.

6. WHO (2001) Health Research Methodology – A Guide for Training in Research Methods.

7. Gilbert N. (1981). Statistics. 2nd ed. CBS College Publishing. Japan

8. Moser CA, Kalton G (1979). Survey methods in social investigation. 2nd ed. Heinemann Educational Books Ltd. London.

Course Name: Dietary Counselling

Course Code: BSCHNUTDSE601

Course Type: **DSE (Theory & Practical)**	Course Details: **DSEC-3 or DSEC-4**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

Course Learning Outcomes:

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

1. *Gain knowledge on traditional and alternate methods to manage disorders*
2. *Understand the importance of communication in managing nutrition related problems*
3. *Draw out a complete counseling plan for individuals based on their physiological conditions using the appropriate tools*
4. *Understand how best to maintain adherence to changed dietary practices for specific physiological conditions*

Course Content:

Theory

1. Definition of Counsellor, Features of dietaryCounsellor.
2. Methodology of dietaryCounselling.
3. Types of Dietitian-Academic, Professional, Administrative.
4. Dietitian as part of Medical term-Role of health protection, Disease prevention and Disease recovery.
5. Pre-diagnostic and post diagnostic phases of dietary counselling.
6. Spiral model of dietarycounselling.
7. Barriers of dietary Counselling and problem solvingstrategies.
8. Field of Employment of dietary counsellor.

Practical

DSE-III
Dietary Counselling(Lab)

1. Questionnaires preparation of dietary counselling- Model questions-on the basisof condition provided(If possible Hospital exposure may beincluded)
2. Submission of Counselling report-any two report in the field of dietarycounselling.

References/ Suggested Readings

1. Mahan LK and Escott-Stump S(2007): Krause's Food and Nutrition Therapy. 12th Ed. WB Saunders Company, London.

2. Robinson. CH, Lawler MR, Chenoweth WL and Garwick, AE(1986): Normal and Therapeutic Nutrition. 17th Ed.,Macmilian Publishing Co.

3.Williams SR (1989): Nutrition & Diet Therapy, 6th Ed. Times Mirror/Mosby College Publishing,St.Louis

Course Name: Patient Education

Course Code: BSCHNUTDSE602

<table>
<tr><td>Course Type: DSE (Theory & Practical)</td><td colspan="2">Course Details: DSEC-3 or DSEC-4</td><td colspan="2">L-T-P: 4 - 0 - 4</td></tr>
<tr><td rowspan="3">Credit: 6</td><td rowspan="3">Full Marks: 100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
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<tr><td>30</td><td>10</td><td>20</td><td>40</td></tr>
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Course Learning Outcomes:

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

1. *Utilize the available different communication tools for patient education*
2. *Identify the right method of communication, media and aid for conducting patient education*
3. *Expertise in organizing a patient/ nutrition education programme employing the audio visual aids*
4. *Acquire appropriate skills in preparation of patient education materials*

Course Content:

Theory

1. Role of Information, Education & Communication in PatientEducation.
2. Knowledge, Attitude & Practice development through patientEducation
3. Problems of Patient Education and itssolving.
4. Outreach system of patient education and its impact on community health upgradation.
5. Types of adaptor/ Patient and theirfeatures.

Practical

DSE-IV
PatientEducation(Lab/Tutorial)

1. Assesment of knowledge upgradation of patient before and after information delivery and its report preparation-Any two report in two different field of patient community.

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.

Course Name: Family Diet Survey

Course Code: BSCNUTDSE603

Course Type: **DSE (Theory & Practical)**	Course Details: **DSEC-3 or DSEC-4**			**L-T-P: 4 - 0 - 4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	20	**40**

Course Learning Outcomes

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

1. *Define the methods of diet survey.*
2. *Demonstrate different methods of diet survey.*

Course Content:

Theory

Family diet survey: - General idea about diet survey different methods foulard for diet survey. Cross & longitudinal survey. Merits & Demerits of different diet survey cycle of diet survey-types duration. Importance's of dietsurvey.

Practical

DSE-I (Lab)

Family diet survey (Practical):- Prepare diet survey report on 3 family at least and submit it after proper forwarding of your concerned teacher.

References/ Suggested Readings

1. Jelliffe, D. B. : Assessment of the Nutritional Status of the Community; World Health Organisation.
2. Sain, D. R. Lockwood, R., Scrimshaw, N. S.: Methods the Evaluation of the Impact of Food and Nutrition Programmes, United Nations University.
3. Ritchie, J.A.S. : Learning Bettor Nutrition FAO, Rome.
4. Gopalon. C. : Nutrition Foundation of India, Special Publication service.
5. Beghin, 1. Cap. M: Dujardan. B. : A Guide to Nutrition Status Assessment. W.H.O. Geneva.
6. Gopaldas, t. Seshadri, S. : Nutrition Monitoring a Assessment: Oxford University Press. 7. Mason, J. B., Habicht, J. P.; Tabatabai. H. Valverde. U.: Nutritional Surveillance, W.H.O.