

The University of Burdwan



Syllabus for B.Sc. General in Nutrition

Choice Based Credit System (CBCS)
w.e.f.- 2017-18

Course components and allotment of credits

Semester	Name of the Course					Total Credits
	Core Course (CC)	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	
I	CC-1A CC-2A CC-3A	AECC-1	-	-	-	22
II	CC-1B CC-2B CC-3B	AECC-2	-	-	-	20
III	CC-1C CC-2C CC-3C	-	SEC-1 (Any one)	-		20
IV	CC-1D CC-2D CC-3D	-	SEC-2 (Any one)	-		20
V	-	-	SEC-3 (Any one)	DSE-1A (Any one) DSE-2A (Any one) DSE-3A (Any one)	-	20
VI	-	-	SEC-4 (Any one)	DSE-1B (Any one) DSE-2B (Any one) DSE-3B (Any one)	-	20

Total Course Number (I-VI)	12 (CC) (12×6)=72 credits	2 (AECC) AECC 1 =4 credits AECC 2 =2 credits Total-6 credits	4 (SEC) (4×2)=8credits	6 (DSE) (6×6)=36 credits	-	122
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Semester wise Breakup (1st Year)

Sem.	Course opted		Title of the course	Credits	Total Credits
	AECC-I		ENVIRONMENTAL STUDIES	4	22
I	CC-1A	Theory	NUTRITIONAL ASPECT OF FOOD ITEMS	4	
		Practical	"	2	
	CC-2A	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	CC-3A	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	AECC-II		ENGLISH COMMUNICATIONS / MIL	2	20
II	CC-1B	Theory	PHYSIOLOGICAL ASPECT OF NUTRITION	4	
		Practical	"	2	
	CC-2B	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	CC-3B	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	

Semester wise Breakup (2nd Year)

Sem.	Course opted		Title of the course	Credits	Total Credits
III	CC-1C	Theory	NUTRITION: LIFE CYCLE APPROACH	4	20
		Practical	"	2	
	CC-2C	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	CC-3C	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	SEC-1	Theory	DIET THERAPY-I <u>OR</u> NUTRITIONAL PHYSIOLOGY-I	2	
IV	CC-1D	Theory	NUTRITIONAL ASSESSMENT AND NUTRITION PROGRAMME	4	20
		Practical	"	2	
	CC-2D		ANY DISCIPLINE OTHER THAN NUTRITION	6	
	CC-3D		ANY DISCIPLINE OTHER THAN NUTRITION	6	
	SEC-2	Theory	DIET THERAPY-II <u>OR</u> NUTRITIONAL PHYSIOLOGY-II	2	

Semester wise Breakup (3rd Year)

Sem.	Course opted		Title of the course	Credits	Total Credits
V	DSE-1A	Theory	THERAPEUTIC NUTRITION AND CRITICAL CARE <u>OR</u> FOOD MICROBIOLOGY AND FOOD BORNE DISEASE	4	20
		Practical	THEORY CONCERN	2	
	DSE-2A	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	DSE-3A	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	SEC-3	Theory	NUTRITIONAL BIOCHEMISTRY <u>OR</u> MOLECULAR BIOLOGY	2	
VI	DSE-1B	Theory	FOOD SAFETY AND FOOD STANDARD <u>OR</u> COMMUNITY NUTRITION AND EPIDEMIOLOGY	4	20
		Practical	THEORY CONCERN	2	
	DSE-2B	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	DSE-3B	-	ANY DISCIPLINE OTHER THAN NUTRITION	6	
	SEC-4	Theory	IMMUNOLOGY, TOXICOLOGY AND PUBLIC HEALTH <u>OR</u> BIostatISTICS AND BIOINFORMATICS	2	

LIST OF CORE COURSE (CC)

CC 1A	:	NUTRITIONAL ASPECT OF FOOD ITEMS
CC 1B	:	PHYSIOLOGICAL ASPECT OF NUTRITION
CC 1C	:	NUTRITION: LIFE CYCLE APPROACH
CC 1D	:	NUTRITIONAL ASSESSMENT AND NUTRITION PROGRAMME

LIST OF SKILL ENHANCEMENT COURSE (SEC)

SEC 1:	DIET THERAPY-I	<u>OR</u>	NUTRITIONAL PHYSIOLOGY-I
SEC 2:	DIET THERAPY-II	<u>OR</u>	NUTRITIONAL PHYSIOLOGY-II
SEC 3:	NUTRITIONAL BIOCHEMISTRY	<u>OR</u>	MOLECULAR BIOLOGY
SEC 4:	IMMUNOLOGY, TOXICOLOGY AND PUBLIC HEALTH	<u>OR</u>	BIostatistics AND BIOINFORMATICS

LIST OF DISCIPLINE SPECIFIC ELECTIVE (DSE) COURSE

DSE 1A:	THERAPEUTIC NUTRITION AND CRITICAL CARE	<u>OR</u>	FOOD MICROBIOLOGY AND FOOD BORNE DISEASE
DSE 1B:	FOOD SAFETY AND FOOD STANDARD	<u>OR</u>	COMMUNITY NUTRITION AND EPIDEMIOLOGY

CORE COURSE (CC)

**CC 1A: NUTRITIONAL ASPECT OF FOOD ITEMS
[TOTAL CREDITS: 6 (THEORY-4, PRACTICAL-2)]**

Theory:

Total Lecture-60

1. **Concept and definition of terms:**
 - Food, Food Groups, Food Pyramid, Functions of food.
 - Nutrient and Nutritive value, Concept of Balanced Diet.
2. **Cereals, Pulses and legumes:**
 - Nutritional aspects of wheat, rice and oat.
 - Types of pulses and legumes, uses, and nutritional aspects.
3. **Milk and milk Products:**
 - Nutritive value of milk, composition of milk,
 - Types of processed milk, milk products (butter, curd, paneer and cheese), Pasteurization.
4. **Egg, Fish and meat:**
 - Nutritional aspects and uses.
 - Nutritional aspects of edible fish and meat, concept of red and white meat.
5. **Vegetables and fruits:**
 - Uses and nutritional aspect of commonly available vegetables.
 - Fresh fruits and dry fruits– raw and processed product.
6. **Salts, Fats and oils:**
 - Uses and nutritional aspects of various salts.
 - Types, sources, use and nutritional aspects of fats and oils.
7. **Methods of cooking:**
 - Dry, moist, frying and microwave cooking.
 - Effect of various methods of cooking on foods, nutrient losses in cooking.

Practical:

Food preparation and nutritive value as per portion size wherever applicable -

1. **Beverages:** Lassi
2. **Cereals:** Fried Rice
3. **Milk and milk products:** Payasam
4. **Eggs:** Egg pudding
5. **Snacks:** Sandwiches

Suggested readings:

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

CC 1B: PHYSIOLOGICAL ASPECT OF NUTRITION
[TOTAL CREDITS: 6 (THEORY-4, PRACTICAL-2)]

Theory:

Total Lecture-60

1. Concept and definition of terms:

- Growth, Development, Nutrition, Malnutrition and Health, Scope of Nutrition.

2. Role of Vitamins and Minerals:

- Fat soluble vitamin-Physiological role, dietary sources and deficiency disorders.
- Water soluble vitamin- Physiological role, dietary sources and deficiency disorders.
- Minerals-Physiological role, dietary sources and deficiency disorders in special references to calcium, iron, sodium and potassium.

3. Principles of meal planning:

- Food exchange list, Factors affecting meal planning and food related behavior.
- Dietary guidelines for Indians.

4. Minimum nutritional requirement and RDA:

- Formulation of RDA, dietary guidelines with reference to man and woman.

5. Energy in human nutrition:

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

Practical:

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

Suggested readings:

- Gopalan C (198). Nutritive value of Indian Foods. Indian Council of Medical Research.
- Guthrie AH (1986). Introductory Nutrition, 6th Ed. The C.V. Mesby Company.
- Indian Council of Medical Research (2003). Nutrient Requirements and Recommended-Dietary Allowance for Indians. New Delhi.
- WHO (1979). A growth chart for International use in Maternal and Children Health Care, Geneva.
- Winword (1988). Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.
- Swaminathan M (2009). Essentials of Foods and Nutrition, Vols -1 and II. Ganesh and Co. Madras.

CC 1C: NUTRITION: LIFE CYCLE APPROACH
[TOTAL CREDITS: 2 (THEORY-2)]

Theory:

Total Lecture-60

1. Nutrition during infancy:

- Breast feeding, Formula feeding, Weaning, Supplementary foods, Nutritional management of Preterm baby.

2. Nutrition for children:

- Diet in early childhood, elementary school age, high school age.

3. Nutrition during pregnancy and lactation:

- Nutritional demands of Pregnancy, Food selection during Pregnancy, Complications of pregnancy and dietary management, Diet during Lactation.

4. Nutrition to athletes:

- Nutritional requirements and dietary management in sports man and athletes, Meal planning for athletes.

5. Geriatric nutrition:

- Planning of meals for older people, Nutrition of aged persons, Physiological complications in geriatric group and dietary modifications required.

Practical:

1. Preparation of normal diets for infant (Dahl soup).
2. Preparation of normal diets for preschool children (Dalia).
3. Preparation of normal diets for pregnant lady and lactating mother (Khicheri with mixed vegetables).

Note: In laboratory note book, calculation of nutritive value should be recorded according to portion size of specific diet for particular individual.

Suggested readings:

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

CC 1D: NUTRITIONAL ASSESSMENT AND NUTRITION PROGRAMME
[TOTAL CREDITS: 6 (THEORY-4, PRACTICAL-2)]

Theory:

Total Lecture-60

1. **Assessment of Nutritional Status and Surveillance:**
 - Direct Nutritional status assessment of human groups - Biochemical, Biophysical and anthropometric methods.
 - Indirect assessment: Secondary sources of community health data.
2. **Concept of surveillance systems:**
 - Role of international and national organizations and agencies (WHO, FAO, UNICEF, CARE, NIN, CFTRI, ICMR).
3. **Communication in Nutrition and Health Education:**
 - Type, process and media of communication.
 - Importance and relevance of Information, Education and communication (IEC) in Nutrition and Public Health..
4. **National Nutritional Intervention Programmes:**
 - Objective, Target group, Scheme details - Integrated Child Development Services (ICDS), Mid Day Meal Programme (MDMP), Vit A prophylaxis Prophylaxis programme, Anemia prophylaxis programme.
5. **Immunization Programme:**
 - Immunization: National Immunization schedule for children and adults, Immunization for foreign travelers.

Practical:

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

Suggested readings:

- Jelliffe DB and Jelliffe EFP (1989). Community Nutritional Assessment, Oxford University Press WHO. The growth chart: A tool for use in infant and child health care. Geneva: WHO; 1986.
- Gopalan C (1992). Growth charts in Primary Health Care – Time for Reassessment. NFI Bulletin.
- Ghosh S (1997). Nutrition and child care – A practical guide. 1st ed. Jaypee Brothers; New Delhi.
- NIPCCD. Growth Monitoring Manual. 1st ed. Deptt. Of Women and child development. Ministry of HRD: 1988.

SKILL ENHANCEMENT COURSE (SEC)

SEC 1: DIET THERAPY-I
[TOTAL CREDITS: 2 (THEORY-2)]

Theory:

Total Lecture-60

1. **General ideas of diet therapy:**
 - Therapeutic adaptations of normal diet, Classification of therapeutic diets (Progressive diets – Normal, Soft, Clear and Full fluid).
2. **Dietitians and hospital basic diets:**
 - Types of dietitians and role of dietitian.
 - Nutritional adequacy of hospital diets, Basic concept and methods of (i) Oral feeding (ii) Tube feeding (iii) Parenteral feeding.
3. **Etiology, symptoms, diagnostic tests and dietary management:**
 - Gastro-intestinal tract and liver diseases - Diarrhoea, Constipation, Irritable Bowel Syndrome, Peptic ulcer and Cirrhosis of liver.
4. **Etiology, symptoms, diagnostic tests and management:**
 - Malabsorption syndrome, Lactose intolerance, Food allergy

Suggested readings:

- Anderson L, Dibble MV, Tukki PR, Mitchall HS, and Rynbergin HJ. Nutrition in Health and Disease. 17th edition, JB Lipincott & Co. Philadelphia.
- Anita FP. Clinical Dietetics and Nutrition. Second Edition, Oxford University Press, Delhi.
- Davis J and Sherer K (1994). Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, WB Saunders Co.
- Escott-Stump S (1998). Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkinson
- Garrow JS, James WPT and Ralph A (2000). Human Nutrition and Diabetics, 10th Edition, Churchill Livingstone.

OR

**SEC 1: NUTRITIONAL PHYSIOLOGY-I
[TOTAL CREDITS: 6 (THEORY-4, PRACTICAL-2)]**

Theory:

Total Lecture-60

1. Body composition:

- Generalized structural makeup of human body.
- Structure and functions of animal cell with special reference to Plasma membrane (Fluid Mosaic Model).
- Nucleus (nuclear membrane, nuclear chromatin and nucleolus).

2. Circulatory and Cardiovascular system:

- Blood and its composition, Blood groups, Mechanism of blood coagulation.
- Structure and functions of heart.
- Cardiac cycle, cardiac output, blood pressure and its regulation.

3. Digestive system:

- Structure and functions of G.I. tract.
- Process of digestion and absorption of food.
- Structure and functions of liver, gallbladder and pancreas.

4. Respiratory system:

- Structure of Lungs and gaseous exchange (oxygen and carbon dioxide transport), Brief idea on Acclimatization.

Suggested readings:

- Chatterjee CC (1988). Text Book of Physiology – Vol I & II.
- Chaudhuri SK (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
- Guyton AC, Hall JE (1966). Text book of Medical Physiology. 9th Ed. Prism Books (Pvt.) Ltd. Bangalore.
- Guyton AC (1985). Function of the Human Body, 4th Edition, W.B. Sanders Company, Philadelphia.
- Hadley ME (2000). Endocrinology. 5th ed. Pearson Education.
- Hoar WS (1984). General and comparative Physiology. 3rd ed. Prentice-Hall of India.
- Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.
- Winword (1988): Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.

SEC 2: DIET THERAPY-II
[TOTAL CREDITS: 2 (THEORY-2)]

Theory:

Total Lecture-60

1. Etiology, clinical features and dietary management:

- Weight Imbalances: Underweight, Overweight and Obesity.

2. Eating disorder:

- Concept of Anorexia nervosa and bulimia.

3. Etiology, Risk factor, Sign and Symptom, Diagnosis and dietary management:

- Diabetes mellitus, Diabetes insipidus and Cancer

4. Etiology, Risk factor, Sign and Symptom, Diagnosis and dietary management:

- Hypertension.
- Renal diseases in special reference to Glomerulonephritis, Uremia, and Nephrosis.

5. Diseases of the cardio vascular system:

- Brief review of lipoproteins (TC, TG, LDL, HDL, VLDL)
- Atherosclerosis–etiology and risk factor.

Suggested readings:

- Anderson L, Dibble MV, Tukki PR, Mitchall HS, and Rynbergin HJ.: Nutrition in Health and Disease. 17th edition, J.B. Lipincott & Co. Philadelphia.
- Anita FP. Clinical Dietetics and Nutrition. 2nd Edition, Oxford University Press, Delhi.
- Davis J and Sherer K (1994). Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.
- Escott-Stump S (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkinson.
- Garrow JS, James WPT and Ralph A (2000). Human Nutrition and Diabetics, 10th Edition, Churchill Livingstone.
- Srilakshmi B (2016). Dietetics. New Age International.

OR

SEC 2: NUTRITIONAL PHYSIOLOGY-II
[TOTAL CREDITS: 6 (THEORY-4, PRACTICAL-2)]

Theory:

Total Lecture-60

1. Excretory system:

- Structure and function of skin.
- Regulation of temperature of the body.
- Functions of Kidney, structure of Nephron.

2. Reproductive system:

- Structure and functions of gonads, concept on menstrual cycle.
- Brief idea of pregnancy, parturition, lactation and menopause.

3. Nervous System:

- Concept on Sympathetic and Parasympathetic nervous System.
- Brief anatomy and functions of Cerebrum, Cerebellum, Hypothalamus, and neuron.

4. Endocrine system:

- Structure and functions of Pituitary, Thyroid and Adrenal gland.
- Structure and functions of Pancreas.

Suggested readings:

- Chatterjee CC (1988). Text Book of Physiology – Vol I & II.
- Chaudhuri SK (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
- Guyton AC, Hall JE (1966). Text book of Medical Physiology. 9th Ed. Prism Books (Pvt.) Ltd. Bangalore.
- Guyton AC (1985). Function of the Human Body, 4th Edition, W.B. Sanders Company, Philadelphia.
- Hadley ME (2000). Endocrinology. 5th ed. Pearson Education.
- Hoar WS (1984). General and comparative Physiology. 3rd ed. Prentice-Hall of India.
- Wilson (1989). Anatomy and Physiology in Health and Illness. Edinburgh, Churchill Livingstone.
- Winword (1988): Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.

SEC 3: NUTRITIONAL BIOCHEMISTRY
[TOTAL CREDITS: 2 (THEORY-2)]

Theory:

Total Lecture-60

1. Carbohydrate:

- Classes of carbohydrates, Properties and dietary importance of starch, sucrose, lactose, glucose and fructose.
- Metabolism: Glycolysis, Tricarboxylic acid (TCA) cycle, Gluconeogenesis, Glycogenesis, Glycogenolysis.

2. Protein:

- Classes, properties, functions and secondary structure of protein (alpha helix, beta pleated sheet).
- Concept and definition: Complete and incomplete proteins, Biological value, Protein Efficiency Ratio (PER), Net Protein Utilisation (NPU), Essential and non-essential amino acids, Deamination, Transamination and Urea cycle.

3. Lipid:

- Classes of lipids, Properties and functions of fats, oils and fatty acid (PUFA, MUFA, SFA. TFA), Concept of Beta - oxidation of fatty acids.

4. Enzyme:

- Classification, properties and factors affecting enzyme activity.
- Brief idea on mechanism of enzyme action (Fischer Lock and key model).

Suggested readings:

- Boyer R (2000). 3rd Ed. Modern Experimental Biochemistry. Person Education, Asia.
- Devlin TM (Ed) (2002). Textbook of Biochemistry with clinical correlations. 5th ed. Wiley-Liss.
- Murray RK, Granner P, Mayes A, Rodwell VW (2003). Harper's Illustrated Biochemistry. McGraw-Hill.
- Switzer RL, Garrity LF (1999). Experimental Biochemistry. WH. Freeman & Company.
- Nelson DL & Cox MM (2004). Lehinger's Principles of Biochemistry. 2nd ed., Macmillan worth Publishers.
- Voet D, Voet JG & Pratt CW (1999). Fundamentals of Biochemistry. Upgrade edition. John Wiley & Sons.

OR

SEC 3: MOLECULAR BIOLOGY
[TOTAL CREDITS: 2 (THEORY-2)]

Theory:

Total Lecture-60

1. Nucleic acid: Bases, nucleosides and nucleotides.
2. DNA structure: DNA double helix (Watson and Crick Model).
3. Types of DNA and RNA, DNA and RNA as genetic material.
4. DNA replication: Semi-conservative replication, Basic mechanism of replication (Prokaryotes).
5. Transcriptional unit and basic concept of transcription (Prokaryotes).
6. Genetic code and basic mechanism of translation (Prokaryotes).
7. Basic concept of genomics, proteomics and metabolomics.

Suggested readings

- Bolandar, M. (2001). Molecular Endocrinology. Elsevier Science.
- Alberts, B. et al. (2008). Molecular Biology of the Cell. 5th Ed. Garland Publishing House.
- Yoshinori Mine (Editor), Kazuo Miyashita (Editor), Fereidoon Shahidi (Editor): Nutrigenomics and Proteomics in Health and Disease: Food Factors and Gene Interactions.
- Van Ommen, B. (2004). Nutrigenomics: Exploiting systems biology in the nutrition and health arenas. Nutrition.20:4-8. Simopoulos, A.P. and Ordovas, J.M. (Editors)(2004). Nutrigenetics and Nutrigenomics.
- Roche, H.M. (2004). Dietary lipids and gene expression. Biochem Soc Trans. 32(Pt 6):999-1002.
- Mount, D. W. Bioinformatics. Sequence and Genome Analysis, CSHL Press.
- Jones.N. C., Pevzner, P. A. (2004). An Introduction to Bioinformatics Algorithms, MPI Press.
- Kaput J, Rodriguez RL. (2004)Nutritional genomics: The next frontier in the postgenomic era. Physiol Genomics.16:166-177.
- Kaput J. and Rodriguez. R. L. (2006). Nutritional Genomics. John Wiley & Sons, Inc.
- DeBusk RM, Fogarty CP, Ordovas JM, Kornman KS. (2005). Nutritional genomics in practice: Where do we begin? *J Am Diet Assoc.* 105:589-598.

SEC 4: IMMUNOLOGY, TOXICOLOGY AND PUBLIC HEALTH
[TOTAL CREDITS: 2 (THEORY-2)]

Theory:

Total Lecture-60

1. Immunology:

- Basic concept of immunity, Types of immunity-innate, acquired, active and passive immunity.

2. Humoral immune system:

- Mechanisms of humoral immunity, Immunoglobulin isotypes-IgG, IgM, IgA, IgD, and IgE.

3. Cell mediated immune system:

- Types of effector T cells, mechanisms of cell mediated immunity.

4. Toxic agents:

- Human exposure, mechanism of action and resultant toxicities of the following xenobiotics: **Metals:** lead, arsenic **Pesticides:** organophosphates, carbamates, organochlorine.

5. Eco-toxicology:

- Brief introduction to avian and aquatic toxicology, movement and effect of toxic compounds in food chain (DDT, mercury), bioaccumulation, biomagnification, concept of BOD and COD.

Suggested reading:

- Immunology, 8th edition, (2012), Male, D., Brostoff, J., Roth, D.B. and Roitt, I., Elsevier-Saunders. ISBN-13: 978-0323080583.
- An Introduction to Immunology, Immunochemistry and Immunobiology, 5th edition, (1988), Barrett, James T., Mosby Company, St. Louis. ISBN-13: 978-0801605307.
- Immunology: An Introduction, 4th edition, (1994), Tizard, I.R., Saunders College Publishing, Philadelphia. ISBN-13: 978-0030041983.
- Cassarett and Doull's Toxicology "The Basic Science of The Poisons" 7th edition (2008).
- Cassarett and Doull's "Essentials of Toxicology" 2nd edition (2010), Klaassen and Whatkins, McGraw Hill Publisher. ISBN-13: 978-0071622400.
- Introduction to Toxicology, 3rd edition (2001), John Timbrell, Taylor and Francis Publishers. ISBN 13: 9780415247627.
- Principles of Toxicology, 2nd edition (2006), Stine Karen and Thomas M Brown, CRC press. ISBN-13: 978-0849328565.
- Lu's basic toxicology: Fundamentals target organ and risk assessment, 5th edition (2009), Frank C Lu and Sam Kacow, Informa Health care. ISBN: 9781420093117.

OR
SEC 4: BIOSTATISTICS AND BIOINFORMATICS
[TOTAL CREDITS: 2 (THEORY-2)]

Theory:

Total Lecture-60

1. Data and Data Types: Primary data and Secondary Data.
2. Measures of Central Tendency: Mean, Median, Mode.
3. Dispersion: Range, Standard Deviation.
4. Hypothesis Testing: Chi-square Test, Student 't' test, Analysis of Variance (ANOVA).
5. Bioinformatics and Health Informatics: Concept and applications.
6. Nucleic acid and Protein Data Bases, Nutrient data bases.
7. Sequence similarity searching by BLAST, Principle, features and types of BLAST, Significance of Multiple Sequence Alignments, Phylogenetic Tree.

Suggested readings

- Saxena Sanjay (2003) A First Course in Computers, Vikas Publishing House.
- Pradeep and Sinha Preeti (2007) Foundations of Computing, 4th ed., BPB Publications.
- Lesk M.A. (2008) Introduction to Bioinformatics. Oxford Publication, 3rd International Student Edition.
- Rastogi S.C., Mendiratta N. and Rastogi P. (2007) Bioinformatics: methods and applications, genomics, proteomics and drug discovery, 2nd ed. Prentice Hall India Publication.
- Primrose and Twyman (2003) Principles of Genome Analysis & Genomics. Blackwell.
- Debjyoti Das (2012). Biostatistics.
- E. Batschelet : Introduction to Mathematics for Life Scientists, Springer Verlag, International Student Edition, Narosa Publishing House, New Delhi (1971, 1975).
- A. Edmondson and D. Druce : Advanced Biology Statistics, Oxford University Press; 1996.
- W. Danial : Biostatistics : A foundation for Analysis in Health Sciences, John Wiley and Sons Inc; 2004.

DISCIPLINE SPECIFIC ELECTIVE (DSE) COURSE

**DSE 1A: THERAPEUTIC NUTRITION AND CRITICAL CARE
(CREDITS: THEORY-4, PRACTICAL-2)**

Theory:

Total Lecture-60

1. Diets for febrile conditions, infections and surgical conditions.
2. **Etiology, Pathophysiology, Critical care and Dietary management:**
 - Sepsis
 - Burns.
3. **Etiology, Pathophysiology, Sign and Symptom and Dietary management:**
 - Osteoarthritis
4. **Etiology, Pathophysiology, Sign and Symptom and Dietary management:**
 - Cold fever
 - Typhoid fever
5. **Etiology, Pathophysiology, Sign and Symptom and Dietary management:**
 - Diarrhoea
 - Cholera

Practical:

1. Therapeutic diet chart preparation for Osteoarthritis (Case specific).
2. Therapeutic diet chart preparation for Typhoid fever (Case specific).
3. Therapeutic diet chart preparation for Burns (Case specific).

Suggested readings

- Khanna K, Gupta S, Seth R, Passi SJ, Mahna R, Puri S (2013). Textbook of Nutrition and Dietetics. Phoenix Publishing House Pvt. Ltd.
- Mahan L K and Escott Stump S (2013). Krause's Food & Nutrition Therapy, 13th ed. Saunders-Elsevier.
- Stacy Nix (2009). William's Basic Nutrition and Diet Therapy, 13th Edition. Elsevier Mosby.
- ICMR (1999). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
- Seth V and Singh K (2007). Diet Planning through the Life Cycle Part II: Diet Therapy. A Practical Manual, 4th edition. Elite Publishing House Pvt. Ltd.

OR

**DSE 1A: FOOD MICROBIOLOGY AND FOOD BORNE DISEASE
[TOTAL CREDITS: 6 (THEORY-4, PRACTICAL-2)]**

Theory:

Total Lecture-60

1. History of Microbiology:

- Microorganisms involved in food fermentation and their role.

2. Food contamination:

Primary sources of food contamination

3. Control of microorganisms:

- Physical and chemical methods used in sterilization and disinfection.
- Uses of high and low temperature, dehydration, freezing, freeze drying, irradiation and use of preservatives.

4. Nutrition and culture of microorganisms:

- Microbial nutrition-Types of culture media, Methods of pure culture and sub culture.
- Bacterial growth-Extrinsic and intrinsic factors affecting growth.

5. Food infections:

- Bacterial food infections-Salmonellosis, Shigellosis and Listeriosis.
- Food poisoning (Staphylococcal & Botulism) - Symptoms, mode of transmission and methods of prevention, Concept of aflatoxin intoxication.

Practical

1. Preparation of liquid (broth) and solid media, Slant and Stab.
2. Microbiological pure culture technique: Spread plate, Pour plate and Streak plate.
3. Microbial Staining: Simple stain, Differential stain (Gram stain).

Suggested readings:

- Pelczar MJ, Chan ECS, and Krieg NR (2004). Microbiology. 5th edition Tata McGraw Hill.
- Prazier WC and Westhoff DC (1988). 4th edition, Food Microbiology, MaGraw Hill Inc.
- Prescott SC, Dunn CG (2009). Industrial Microbiology.
- Roday S (1999). Food Hygiene and Sanitation, 1st Edition, Tata McGraw Hill, New Delhi.
- Stanier RY, Ingraham JL, Wheelis ML, and Painter PR (2005). General Microbiology. 5th edition. McMillan.
- Talaro K and Talaro A (2011). Foundations in Microbiology, 8th ed. McGraw-Hill
- Tortora GJ, Funke BR, Case CL (2008). Microbiology. An Introduction. 9th ed. Benjamin/Cummings Publishing.

DSE 1B: FOOD SAFETY AND FOOD STANDARD
[TOTAL CREDITS: 6 (THEORY-4, PRACTICAL-2)]

Theory:

Total Lecture-60

1. **Food additive and food safety:**
 - Concept of food safety, factors affecting food safety.
 - Food additives-various types and their effects on health.
2. **Food security:**
 - Concept of food security, factors affecting food security.
3. **Food adjuncts and preserved products:**
 - Spices (Chilies, Turmeric, Garlic and Ginger), use and nutritional aspect.
 - Jams, Jellies, Squashes—uses and nutritional aspects.
4. **Food adulterants:**
 - PFA definition of food adulteration, Common adulterants in food and their effects on health.
 - Common household methods to detect adulterants in food,
5. **Food laws and regulatory authority:**
 - Prevention of Food Adulteration (PFA) Act.
 - Regulating authority-Codex Alimentarius, ISI, Agmark, Fruit Products Order (FPO), Meat Products Order (MPO), Bureau of Indian Standards (BIS), MMPO, FSSAI.

Practical:

1. Detection of vanaspati in ghee.
2. Detection of khesari flour in besan.
3. Detection of argemone oil in edible oil.
4. Detection of metanil yellow in turmeric.

Suggested readings:

1. Gopalan C and Kaur S (Eds.) (1993). Towards Better Nutrition, Problems and Policies, Nutrition Foundation of India.
2. Tovel AP (1984). Standardising Food Service for Quality and Efficiency. AVI Publishing Company INC.
3. Dept. of WCD, Govt. of India. (1993): National Nutrition Policy.
4. Food and Nutrition Board, Dept. of WCD, Govt. of India (1995): National Plan of Action on Nutrition.
5. Roday S (1999). Food Hygiene and Sanitation, 1st Edition, Tata McGraw Hill, New Delhi.
6. Diehl JF (1995). Safety of Irradiated Foods Marcel Dekker Inc, New York.
7. Raheena Begum: A textbook of food, nutrition and dietetics Sterling Publishers, New Delhi.
8. Joshi SA. Nutrition and Dietetics. Tata McGraw Hill, Publications, New Delhi.
9. Mahan LK and Escott-Stump S (2000). Krause's Food Nutrition and Diet Therapy, 10th edition, W.B. Saunders Ltd.

OR

**DSE 1B: COMMUNITY NUTRITION AND EPIDEMIOLOGY
[TOTAL CREDITS: 6 (THEORY-4, PRACTICAL-2)]**

Theory:

Total Lecture-60

1. Concept of population and Community:

- Concept and characteristic features of population, Community and types of community.
- Factors affecting health of community – environmental, social, political, cultural and economical.

2. Community water and waste management:

- Source of water, safe drinking water, etiology and effects of toxic agents.
- Microbial examination of water, Water-Potability test (MPN Test).
- Sewage disposal and treatment.

3. Nutritional problems in community:

- Etiology, Clinical signs and management-Kwashiorkor, Marasmus, and Anaemia.

4. Concept of Disease:

- Endemic, Epidemic and Pandemic, Acute and Chronic.
- Communicable and Non-communicable diseases, Zoonosis, Epizootic and Enzootic.

5. Principles of Epidemiology:

- Epidemiological study-Descriptive and Analytical.
- Rate of Disease in a Population-Attack rate, Mortality and Morbidity rate, Prevalence and Incidence of a disease, The incubation period, Quarantine period.
- Factors that Influence the Epidemiology of Disease.

Practical:

Visit to old age home / ICDS Centre / Nutrition Rehabilitation Centre (NRC) / Slum area / Any public place and Report Preparation on nutritional status and health concern (In any area at least 8-10 case studies to be done). **OR** Visit to a Rural Technology Centre/Community Welfare Centre and a brief field report on Rural Technology and Community Development.

Suggested readings:

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