SYLLABUS
FOR
M.Sc. IN NUTRITION AND PUBLIC HEALTH
(With effect from the session 2021–2023)
[CHOICE BASED CREDIT SYSTEM]

DEPARTMENT OF NUTRITION AND PUBLIC HEALTH

RANI RASHMONI GREEN UNIVERSITY

TARAKESWAR, HOOGHLY

WEST BENGAL, INDIA

OUTLINE OF THE SYLLABUS FOR M.Sc. IN NUTRITION AND PUBLIC HEALTH

Course Code		Title	Marks	Credits
Semester-I				
GNPHT-11	Unit 1 Unit 2	Introduction to Nutrition and Public Health Concept of Population, Community and Disease Management	50	4
GNPHT-12	Unit 1 Unit 2	Anatomy and Physiology Physiology of Digestive Glands and Endocrine Glands	50	4
GNPHT-13	Unit 1 Unit 2	Major Nutrients and Nutritional Biochemistry and Physiology Vitamins, Minerals and Trace Elements, Enzymes and Dietary Fibres	50	4
GNPHT-14A OR (Choice based) GNPHT-14 B	Unit 1 Unit 2	Biosystematics and Taxonomy Biodiversity and Conservation	50	4
	Unit 1 Unit 2	Rural Technology and Economic Botany Rural Technology and Economic Zoology		
GNPHP-15		Practical & Assignments	100	8
Total of Semester-I			300	24
Semester-II				
GNPHT-21	Unit 1 Unit 2	Food Commodities and Food Processing Nutrition in Phases of Human Life	50	4
GNPHT-22	Unit 1 Unit 2	Pathophysiology and Diet Therapy of Gastrointestinal Diseases Pathophysiology and Diet Therapy of Heart and Kidney Diseases Diabetes and Neoplastic Disorders	50	4
GNPHT-23	Unit 1 Unit 2	Basic Microbiology and Bacteriology Virology	50	4
GNPHT-24A OR (Choice based) GNPHT-24B	Unit 1 Unit 2	Health Policies Health Education and Health Programmes	50	4
	Unit 1 Unit 2	Social Medicine Rural Health		
GNPHP-25		Practical & Assignments	100	8
Total of Semester-II			300	24
Semester-III				
GNPHT-31	Unit 1 Unit 2	Epidemiology and Disease Ecology Parasitology	50	4
GNPHT-32	Unit 1 Unit 2	Anthropometry Biochemical Assessment of Nutritional Status	50	4
GNPHT-33	Unit 1 Unit 2	Food Microbiology and Food Borne Diseases Food Toxicants and Food Hygiene	50	4
GNPHT-34A OR (CHOICE BASED) GNPHT-34B	Unit 1 Unit 2	Cell Biology Immunology	50	4
	Unit 1 Unit 2	Microbial Genetics Animal and Human Genetics		
GNPHP-35		Practical & Assignments	50	4
Total of Semester-III			250	20

Semester-IV				
GNPHT-41	**Unit 1** **Unit 2**	**Medical Entomology and Vector Biology** **Vector Control**	**50**	**4**
GNPHT-42	**Unit 1** **Unit 2**	**Environmental Biology** **Environmental Health**	**50**	**4**
GNPHT-43	**Unit 1** **Unit 2**	**Biostatistics and Research Methodology** **Bioinformatics and Nutrigenomics**	**50**	**4**
GNPHT-44	**Practical & Assignments**	**Project proposal writing/ Review Paper/ Term Paper/ Project work and Dissertation/ Internship**	**50**	**8**
		Seminar Presentation [Presentation + Viva]	**50** (40 + 10)	
Total of Semester-IV			**250**	**20**

COURSE OBJECTIVES:

There is a growing need for Nutrition and Public health Biologists in the field of Nutrition, Public Health Biology and Epidemiology in view of emerging and re-emerging non-communicable and communicable diseases in India and other tropical countries.M.Sc.in "Nutrition and Public Health" degree course under Rani Rashmoni Green University is offered with the objective to establish the students as a Nutrition and Public health Biologists toidentify various dietary and nutrition problems prevalent among different segments of the population in the country, to monitor diet and nutrition situation of the country to evolve effective methods of management and prevention of nutritional problems, to conduct operational research connected with planning and implementation of national nutrition programmes. The State Health Departments, National Centre for Disease Control (NCDC), National Rural Health Mission (NRHM), National Urban Health Mission (NUHM), National Vector Borne Disease Control Programme (NVBDCP), and ICMR Institutes (VCRC, CRME, NIMR and RMRC) require personnel with knowledge and expertise on Nutrition Biology, Public Health Biology, Vector Biology and Epidemiology for the prevention/control of various microbial diseases, vector borne and parasitic diseases. After completion of this P.G. course and also fulfilling the eligibility criteria as per UGC and Government norms, the successful candidates will be eligible to serve as Teaching Faculty of various institutes. The successful candidates can also perform Research work and enroll them to Ph.D programmes fulfilling the criteria as laid down by UGC and University Authority. The successful candidates will also establish him/her to be competent enough to work with Medical and Allied Health Professionals to understand the principles of dietary management and apply, while providing Quality Patient Care in the selected areas of Clinical Specialty in the Hospital and Community.

SEMESTER-I

COURSE CODE: GNPHT-11

UNIT -1: INTRODUCTION TO NUTRITION AND PUBLIC HEALTH

Concept of food and Diet

Concept on food, diet and nutrients
Food groups and Food pyramid
Functional Foods
Comparison among Core foods, Secondary foods and Peripheral foods
Concept of balanced diet, Healthy diet and dietary practices
Understanding Major and Minor food

Concept of Nutrition

Definition of Nutrition, Basic terms used in nutrition
Understanding Community Nutrition and its relation to health and wellbeing
Malnutrition and Under-nutrition and its different spectrum and manifestations
Concept on Bioactive compounds
Definition and multidisciplinary nature of public nutrition, Concept and scope
Role of Public Nutritionist

Concept of Social Medicine and Public Health

Definition and concept of Public Health, Core functions and essential services
History of public health and its milestones
Comprehensive health care
Social development and health
Dimensions and determinants of health
Concepts and indicators of health and wellbeing natural history of disease
Levels of prevention, globalization and its impact on health
Roles and responsibility of state, community and private sector in health

UNIT 2: CONCEPT OF POPULATION, COMMUNITY AND DISEASE MANAGEMENT

Concept of Population and Community:

Population dynamics-Natality, Mortality, Survivorship and age distribution Community structure, Major and Minor community
Relationship between species and number (Abundance, Density, Frequency, Relative abundance, Dominance, Dominance index, Species diversity), Community boundary

Concept of disease:

Endemic, Epidemic and Pandemic, Acute and Chronic, Communicable and Non-Communicable; Infectious, Contagious, Sporadic and Zoonotic diseases; Epizootic, Enzootic, Vector-Borne, Nosocomial, Opportunistic and Iatrogenic diseases
Infectious disease epidemiology: Infection, Contamination, Infestation
Nature of infectious and communicable diseases
Factors that influence the epidemiology of a disease and re-emergence of a disease

Rate of a disease in a population (attack rate, morbidity rate, mortality rate, incidence and prevalence)

Definitions and concept on:

Parasites, vectors, hosts, carriers, mechanical transmitters

Climate change and disease transmission

Impact of climate change in disease transmission, Factors affecting the emergence and reemergence of diseases

Disease prevention and control

Controlling reservoir: Early diagnosis Epidemiological investigation
Notification, Isolation, Treatment, Quarantine
Immunization: Active, Passive, Combined passive and active, Chemoprophylaxis, Immunization Schedule
WHO epi schedule, Non-specific measures, Health advice to travelers: Individual, local, National and International

Disinfection

Definitions: Disinfectant, Disinfection, Sterilization, Antiseptic, Asepsis, Sanitizer, Sterile, Hospital Disinfectant, Germicide, Detergent, Cleaning, Deodorant, Properties of ideal disinfectant, Types of disinfection

Sterilization and control of Microbes

Principles and mode of action of dry heat, moist heat, filtration, pasteurization and radiation. Chemical agents for sterilization. Antibiotics and their mode of action. Tests for sensitivity to antimicrobial agents and its quality control. Antimicrobial resistance.

References:

- Ghosh S (1997). Nutrition and child care – A practical guide. 1st ed. Jaypee Brothers; New Delhi.
- Gopalan C (1992). Growth charts in Primary Health Care – Time for Reassessment.
- Hughes O, Bennion M (1970). Introductory Foods, Macrnillan & Co. New York.
- 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.
- Pomeranz Y (Ed) (1991). Functional Properties of Food Components, (2nd edition), Publishers.
- Tindall HD (1983). Vegetables in the Tropics, MacMillan Press, London.
- Winton AL, Winton KB (1999). Techniques of Food Analysis. Allied Scientific

COURSE CODE: GNPHT-12

UNIT 1: ANATOMY AND PHYSIOLOGY

Digestive system

Anatomy of oral cavity, esophagus, stomach, duodenum, jejunum, ileum, colon, rectum and anal canal
Process of digestion and absorption of food

Circulatory system

Functions and properties of blood
Formation of blood cells, blood groups and blood types, Haemostasis
Structure of blood-vessels and heart
Cardiac muscle tissue and cardiac conduction system
Cardiac cycle and cardiac output
Blood pressure and its regulation

Osteoskeletal system

General anatomy of musculoskeletal system
Physiology of muscle contraction

Neuromuscular system

Anatomical overview of central and peripheral nervous system
Brief anatomy and functions of cerebrum, cerebellum, hypothalamus and neuron
Concept of synapse and synaptic transmission

Genito-urinary system

Structure and function of kidney
Physiology of urine formation
Anatomical overview of human reproductive system
Fertilization, Spermatogenesis and oogenesis

Integumentary system

Structure and function of skin
Regulation of temperature of the body

Energy and metabolism

Physiological understanding of Energy and metabolism, BMR, Specific dynamic action, Anabolic and catabolic pathway

UNIT -2: PHYSIOLOGY OF DIGESTIVE GLANDS AND ENDOCRINE GLANDS

Digestive glands

Salivary glands and its digestive physiology
Movements of gut and gut motility
Physiological function of stomach
Physiology of hepatobiliary system
Physiology of pancreas and its metabolic functions
Physiological function of small and large intestine

Endocrine glands

Structure of anterior and posterior Pituitary, Mechanism action of water and lipid soluble hormones, Signal pathways
Formation, Storage and Release of Thyroid Hormones, Actions of Thyroid Hormones, Control of Thyroid Hormone secretion
Physiology of Parathyroid gland
Structure of Adrenal gland, Physiology of Adrenal cortex and adrenal medulla,
Mechanism of hormone action and signal pathways
Physiology of Gonads.

References:

- Chaudhuri, S. K. (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd.
- Ganong, W. F. (2003). Review of Medical physiology. 21st ed. McGraw Hill.
- Hildebrand, M. (1995). Analysis of Vertebrate Structure. John Wiley and Sons.
- Hill, R.W., Wyse, G.A. and Anderson, M. (2008). Animal Physiology. 2nd ed. Sinauer Associates Inc.
- Hoar, W. S. (1984). General and comparative Physiology. 3rd ed. Prentice-Hall of India
- Koppen, B. M. and Stanton, B. A. (2009). Berne and Levys' Physiology. 6th ed. Mosby.
- Romer, A. S. and Parsons, T. S. (1986). The vertebrate body. 6th ed. Saunders College Publishing.
- Bolandar,M.(2001).*Molecular Endocrinology*. Elsevier Science.
- Greenspan, F. S. and Gardener, F. G. (2003). *Basic and Clinical Endocrinology*. 7th ed. McGraw Hill.
- Ganong, W. F. (2003). Review of Medical physiology. 21st ed. McGraw Hill.
- Hadley, M. E. (2000). *Endocrinology*. 5th ed. Pearson Education.
- Norris, D. O. (2006). *Vertebrate Endocrinology*. 4th ed. Academic Press.
- Randall, D., Burggren, W. and French, K. (2002). Eckert's Animal Physiology – Mechanisms and Adaptation. 5th ed. W. H. Freeman.
- Sherwood, L. (2004). Human Physiology: From cells to systems. 5th ed. Thomson Brooks Cole.

COURSE CODE: GNPHT- 13

UNIT 1: MAJOR NUTRIENTS AND NUTRITIONAL BIOCHEMISTRY AND PHYSIOLOGY

Carbohydrate:

Types of dietary carbohydrates and their relative importance
Digestion and absorption of carbohydrates
Carbohydrate Metabolism (Glycolysis, Gluconeogenesis, Hexose Monophosphate shunt, Citric acid cycle)
Health aspects of sugar and non-starch polysaccharides

Protein:

Composition and nature of proteins, Protein-providing foods in the diet
The role of proteins and amino acids in health and disease
Basic structure of proteins and their alternation by cooking
Digestion and absorption of proteins
Amino-acid metabolism, Control of Protein metabolism
Metabolic changes and clinical features of Protein Energy Malnutrition (Marasmus and Kwashiorkor)

Fats:
Nature and characteristics of fats important in human nutrition
Digestion and absorption of fats
Importance of the essential fatty acids
Role of fats in the diets and trends in fat consumption
Advantages and disadvantages of fat in the diet
Importance of mono and poly unsaturated fatty acids, omega-3 fatty acids in the body

UNIT 2: VITAMINS, MINERALS AND TRACE ELEMENTS, ENZYMES AND DIETARY FIBRES

Vitamins:
Physiological action, sources, functions and deficiency symptoms of: Vitamin A, D, E and K, Thiamin, Riboflavin, Vitamin B12, Pantothenic acid, Folic Acid, Pyridoxine, Niacin, Ascorbic acid

Minerals and Trace elements
Absorption, utilization, sources, functions and deficiency symptoms of calcium and phosphorous. Factors affecting calcium absorption. Role of calcium in ossification and bone growth. Functions, Sources, absorption, utilization and storage of iron. Role of iron in prevention of anemia
Physiology, source and role of iodine, fluorine, zinc, copper, manganese, selenium and chromium in human nutrition

Dietary fibers:
Components of dietary fiber, Physiological and metabolic effects of dietary fiber, Role of fibers in prevention of diseases (coronary heart disease, diabetes mellitus, constipation, colon dysfunction and weight control). Disadvantages of dietary fibers

Nutraceuticals
Concept, classification, sources and importance of Nutraceuticals

Enzymes and Co-enzymes:
General properties, nutritional classification and functions of digestive enzymes
Mechanism of enzyme action and factors affecting enzyme action
Definition of co-enzymes, types of co-enzymes, physiological functions of co-enzymes
Diseases and disorders related to co-enzymes

References:

- 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.
- Nelson DL & Cox MM (2004). Lehinger's Principles of Biochemistry. 2nd ed., Macmillanworth Publishers.
- Switzer RL, Garrity LF (1999). Experimental Biochemistry. WH. Freeman & Company.

- Voet D, Voet JG & Pratt CW (1999). Fundamentals of Biochemistry. Upgrade edition. John Wiley & Sons
- 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.
- Swaminathan M (2009). Essentials of Foods and Nutrition, Vols -1 and II. Ganeshand Co. Madras.
- WHO (1979). A growth chart for International use in Maternal and Children HealthCare, Geneva.
- Winword (1988). Sear's Anatomy and Physiology for Nurses. London, Edward Arno ll.

COURSE CODE: GNPHT-14A

UNIT-1: BIOSYSTEMATICS AND TAXONOMY

Biosystematics and Taxonomy
Importance and applications of biosystematics in biology
Basic concepts of biosystematics and taxonomy of eukaryotes
Methods of taxonomy of bacteria and viruses
Micro- and Macro-taxonomy, Levels of taxonomic study
Concepts of species
Types –Typological, Biological and Evolutionary, Kinds of species
Rules of nomenclature
Kinds of Type Specimens
Holotype, Paratype, Lectotype, Neotype, Allotype, Metatype, Monotype
Basic concept on
Natural selection, Fitness, Evolution, Adaptation, Directional selection
Stabilizing selection, Disruptive selection, Mutation
Types of speciation: Allopatric, Parapatric, Peripatric and Sympatric speciation
Modern trends in polyphasic taxonomy
Concept of phenetics and cladistics
Physiological and biochemical taxonomy
Biochemical and molecular techniques used in taxonomy

UNIT-2: BIODIVERSITY AND CONSERVATION

Biodiversity as Bio-resource
Biodiversity as a source of foods, drugs and food-medicines
Aesthetics and cultural benefits of biodiversity
Wildlife values and Eco-tourism, Wildlife wealth of India
Levels of Biodiversity
Community diversity (alpha, beta and gamma diversity)

Biome types of India: Alpine, tundra, grassland, forest, desert, aquatic, marine and wetlands

General idea about some marine animals

Marine Invertebrates of the Phyla: Protista, Porifera, Cnidaria, Ctenophora, Annelida, Arthropoda, Mollusca and Echinodermata
Marine Fish: Shark and Electric Ray
Marine Reptiles: Salt water crocodiles, Sea turtles and Sea snakes, Marine Birds: Albatross
Marine Mammals: Whales, Dolphins and Walrus

Mangroves

Special features of mangroves
Flora and Fauna of mangrove ecosystem.
Role of mangroves in Carbon sequestration

Microbes as Bio-resource

Role of microbes in the production of fermented foods, antibiotics, biopesticides, bioplastics, biofertilizers, biofuels and bioenergy

Biodiversity Hot spots

Concepts, distribution and importance

Conservation of Biodiversity

Aims and objectives of wildlife conservation
Endangered, threatened and rare species, IUCN red list categories
Sustainable management of wildlife diversity: In-situ and Ex-situ conservation
National Parks, Sanctuaries, Biosphere Reserves, Reserve forests of India
Project Tiger and Project Rhino

References:

- Blackwelder, R. E., (1967). Taxonomy- A text and reference book. John Wiley and Sons.
- Forey, P. L., Humphries, C. J., Kitching, I.J., Scotland, R. W.; Siebert, D. (1993). Cladistics – A practicalcourse in systematics. Oxford University Press.
- Kardong, K. V. (2002). Vertebrates: Comparative anatomy, function evolution. Tata McGraw Hill.
- Kapoor, V. C. and Kapoor, M. (2012). Theory and Practice of Animal Taxonomy. Oxford and IBH. 7th ed.
- Kent, G. C. and Carr, R. K. (2001). Comparative anatomy of the Vertebrates. 9th ed. Mc Graw Hill.
- Kitching, I.J., Forey, P. L., Humphries, C. J., Williams, D. (1998). Cladistics: Theory and Practice of
- Parsimony Analysis (Systematics Association Special Volumes). 2nd ed. OUP Oxford.
- Lomolino, M.V., Riddle, B. R., Whittaker, R. J. and Brown, J. H. (2010). Biogeography. 4th Ed. Sinauer Associates.
- Mayr, E. and Ashlock, P. D. (1991). Principles of Systematic Zoology. 2 ed. McGraw-Hill.
- Mayr, E. (1969). Principles of Systematic Zoology. Tata McGraw-Hill.

- Mayr, E. (1997). This is biology: the science of the living world. Belknap, Harvard University Press, Cambridge, Mass.
- Quicke, D. A. J. (1993). Principles and Techniques of Contemporary Taxonomy. Blackie Academic and Professional.
- Scott-Ram, N. R. (1990). Transformed cladistics, taxonomy and evolution. Cambridge University Press.
- Simpson, G. G. (1961). Principles of Animal Taxonomy. Columbia University Press. New York.
- Groom, M. J., Meffe, G. K. and Carroll, C. L. (2005). *Principles of Conservation Biology*. 3rd ed. Sinauer Associates Inc. Publishers, USA.
- Hunter, M. L. Jr. and Gibbs, J. P. (2006). *Fundamentals of Conservation Biology*. 3rd ed. Wiley-Blackwell.
- Pullin, A. S. (2002). *Conservation Biology*. Cambridge University Press.
- Sodhi, N. S. and Ehrlich, P.R. (2010). *Conservation Biology for all*. Oxford Biology, USA.

COURSE CODE: GNPHT-14B:

UNIT-1: RURAL TECHNOLOGY AND ECONOMIC BOTANY

Nature and Characteristics of Rural Resources

Definition and meaning of resources, Types and characteristics of rural resources-natural and man-made

Horticulture

Scope of horticultural crops. Soil and climatic requirements for fruits and vegetables, nursery raising and management. Crop production technology for major fruit crops viz., mango, banana, sapota, aonla, pomegranate, guava, etc.

Mushroom cultivation technique

Types of edible Mushroom species, Nutritional value of Mushrooms, Medicinal value of mushrooms. Mushroom Production Technique – Button Mushroom (*Agaricus*), Oyester Mushroom (*Pleurotua*), Paddy Straw Mushroom (*Volvariella*). Spawn Production Techniques: Preparation of culture, mother spawn production, multiplication of spawn.

Organic manures:

Green manuring. Recycling of organic residue and bio-fertilizers

Medicinal and aromatic plants

Importance and needs of cultivation of medicinal and aromatic plants, nutritional value, scope, development and future prospects

Medicinal plants: Amla, Shankhpuspi, Brahmi, Chirayita, Arjuna, Kutki, Harad, Tulsi, Ashwagandha, Aloe-Vera, Sarpgandha, Isubgol, Kuth, Jatamanshi Garlic, Ginger Turmeric, Black pepper, Coriander, Fenugreek, Clove and other species related to local condition.

Aromatic Plants: Lemon grass, Lavender grass, Citronella grass, Geranium, Ocimum, Mentha, Eucalyptus and other species related to local conditions.

UNIT-2: RURAL TECHNOLOGY AND ECONOMIC ZOOLOGY

Vermi Technology

External and internal features of earthworms. Use of earthworms, vermicomposting materials, requirement of vermiculture and vermicomposting, Factors affecting earth worm's growth. Types of vermicomposting, methods of vermicomposting, Harvesting and storage of vermicompost, advantages of vermicompost, Use and benefits of Vermicompost, Effect of vermicompost on plants, chemical composition of vermicompost, Chemical composition, use and advantages of vermiwash.

Apiculture

Importance and future prospects of apiculture, History of apiculture industries in India and world. Species of honeybee and their castes. Equipment and Appliances: Bee Hive, Comb, other appliances for bee keeping. Life cycle and developmental stages of Honey Bees (Egg, Larva, Pupa and Adult). Artificial feeding of honeybees. Properties of Honey: Physical and chemical properties of honey, Honey bee products and their values. Honey extraction and processing.

Sericulture

Types of silkworms. Distribution and Races. Exotic and indigenous races of mulberry and non-mulberry silk worms. Life cycle of *Bombyx-mori*. Structure of silk gland and secretion of silk. Selection of mulberry variety and establishment of mulberry garden Rearing house and rearing appliances. Silkworm rearing technology: Early age and Late age rearing, Spinning, harvesting and storage of cocoons. Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial. Prevention of pests and diseases.

Ornamental fish culture

Scope of aquarium fish industry as a cottage industry, exotic and endemic species of aquarium fishes. Common characters of Fresh water and Marine Aquarium fishes such as Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish and Butterfly fish

Integrated pest management

Major and minor pests of paddy, wheat, jute and vegetable crops Importance of Integrated Pest Management (IPM), uses of bio-control agents and bio-pesticides

References:

- Hartmann HT & Kester DE. 1989. Plant Propagation – Principles and Practices. Prentice Hall of India.
- Bose TK, Mitra SK & Sadhu MK. 1991. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prokash.
- Peter KV. (Ed.). 2008. Basics of Horticulture. New India Publ. Agency. Singh SP. 1989 Mist Propagation. Metropolitan Book Co.
- Rajan S & Baby LM. 2007. Propagation of Horticultural Crops. New India Publ. Agency.
- Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.

- M. K. Sadhu, Plant propagation, New Age International Publishers.
- S. C. Day, Mushroom Growing, Agrobios India.
- Pathak Yadav Gour, Mushroom: Production and Processing Technology, Agrobios India.
- R. C. Ram, Mushroom and their Cultivation, Technique Aavishkar Publishers, Distributors, Jaipur India.
- Prajapat, Purohi, Sharms. Kumar,A Handbook of Medicinal Plants: A Complete Source Book, Agrobios India.
- Dr. D. K. Bhatt/ Dr. Aparna Raj/ Kiran Bhatt, Herbal and Medicinal Plants of India Shree Publishersand Distributors, New Delhi.
- N. Kumar/ JBM Md. Abdul Khader/ P. Rangaswami/ I. Irulappan, Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- T. V. Sathe, Vermiculture and Organic Farming, Daya Publishing House, New Delhi.
- Arun K Sharma. A Hand book of Organic Farming, Agro bios Inida, New Delhi.
- Dharm Singh/ Devendra Pratap Singh, A handbook of Beekeeping: Agrobios, India.
- E. F. Phillips. Beekeeping, Agrobios, India.

COURSE: GNPHP-15: PRACTICAL
Time: 6 hrs.

1. Detection of haemoglobin percent, C.T. and B.T.
2. Estimation of blood pressure by sphygmomanometer (Ausculatory method)
3. Measurement of blood pressure, sweat rate during exercise
4. Study of pulse rate and breathing rate with the change of postures
5. Protein estimation of lowry method
6. Biochemical estimation of cholesterol and sugar
7. Total count of RBC and WBC
8. Differential count of W.B.C
9. Agglutination reactions: Direct and indirect agglutination tests.
10. Identification of patients with reasons (photographs): Ricketts, Marasmus, Kwashiorkor,
11. Identification with reasons of histological slides (Liver, Kidney, Lung, Small intestine, Stomach, Thyroid, Adrenal, Pancreas, Testis, ovary and muscle of mammals
12. Submission of Laboratory Records
13. Viva-voce

SEMESTER-II

COURSE CODE: GNPHT-21

UNIT-1: FOOD COMMODITIES AND FOOD PROCESSING

Plant based foods and food processing

Cereals and Millets

Rice carbohydrate composition and properties, other constituents of the rice kernel, Rice processing, Food and beverage applications of rice. Structure of wheat grain, Wheat carbohydrate composition and properties, Other constituents of wheat, Flour milling, Bakery products based on wheat, Durum wheat products, Products based on other types of wheat, Beverages based on wheat, Maize carbohydrate composition and properties, Other constituents of the maize kernel, Maize processing, Applications of maize in foods, Applications of maize in beverages, Barley carbohydrate composition and properties, Applications of barley in foods, Proso millet carbohydrate composition and properties, Proso millet protein composition and properties, Processing of proso millet, Food and beverage applications of proso millet, Oat carbohydrate composition and properties, Other constituents of the oat kernel. Food and beverage applications of oats. Nutritional aspects of wheat, maize, rice, millet and oat.

Pulses and legumes

Types of pulses and legumes. Structure, processing, storage and use in various preparation. Nutritional aspects and storage.

Vegetables and fruits

Nutritional aspect of commonly available green leafy vegetables, roots and tubers – raw and processed products. Fruit processing: Principles of heat treatment, Fruit freezing principles. Fruit drying Principles. Fresh-Cut fruits. Minimally processed fruits and fruit products and their microbiological safety. Food additives in fruit processing. Nutritional aspects and commodity processing: Apples, Apricots, Oranges and citrus juices, Cranberry, Blueberry, Currant, and Gooseberry, Strawberries and Raspberries, Guava, Lychee, Papaya, Banana, Mango, and Passion Fruit. Date fruits production and processing.

Sugar and sugar products:

Types of natural sweeteners, manufacture, selection, storage and use as preserves, stages in sugar cookery

Fats and oils

Composition and types of fats/oils. Nutritional aspects of fats and oils.
Rancidity in fat and its prevention. Changes in fat during heating.

Beverages

Nutritional aspects of tea, coffee and wines. Manufacturing, constituents and health benefits of white tea, black tea and green tea. Antioxidant and antimicrobial properties of tea polyphenols

Herbs and spices:

Sustainable production of herbs and spices, Uses of herbs and spices in the foods and beverage industry, perfume and cosmetics industries, Nutritional and medicinal aspects of herbs and spices: Ajowan, Allspice, Aniseed, Basil, Long pepper, Lovage, Marjoram,

Mints, Mustard, Nutmeg, Onion, Oregano, Parsley, Pepper, Pomegranate, Rosemary, Sage, Star anise, Summer savory, Sweet flag, Tarragon, Thyme, Capsicum, Chilies, Cardamom, Clove, Curry leaf, Coriander, Turmeric, Garlic and Ginger. Safety and efficacy issues: a phytochemical perspective. Natural antioxidants in herbs and spices

Preserved products

Jams, Jellies, Pickles, Syrup, Squashes –uses and nutritional aspects.

Baking technology

Bread, biscuits/ Cookies and cake. Principles of baking, ingredients and their functions, methods of preparation

Animal based foods and food processing

Milk and milk Products

Nutritive value of milk, Composition, Pasteurization, Types of processed milk, Milk products (butter, curd, paneer and cheese)

Eggs

Nutritional aspects and uses**.** Composition, quality factors, storage, bacterial infection and pasteurization, freezing, drying and egg substitutes

Fish

Major edible freshwater and marine fishes and their nutritional significance**.** Composition, onboard handling & preservation, drying and dehydration, salt curing, smoking, marinades, fermented products, canning, Modified Atmosphere Packaging, and quality factors

Meat

Major edible fish and meat: storage, spoilage and nutritional aspects

Composition, variety, grading, ageing, curing, smoking and tenderizing of meat, meat pigments and colour changes, cooking, storage, methods of preservation for value addition and spoilage

Salt

Types and uses

Methods of cooking

Dry, moist, frying and microwave cooking**.** Effect of various methods of cooking on foods, nutrient losses in cooking

Fortified foods:

Fortified foods with vitamins: analytical concepts to assure better and safer products

UNIT-2: NUTRITION IN PHASES OF HUMAN LIFE

Nutrition of newborn, infants and school going children

General understanding of Nutritional requirement of a Human

Nutritional requirement of a newborn and infant

Breast feeding and its importance, Benefits of breast milk in nutrition of Newborn, Breast feeding alternatives, Growth and nutritional monitoring of newborn and infants

Nutritional requirement of a Growing Child, Nutritional assessment of growing child, Nutritional challenges of a growing child, Nutritional requirements of adolescents

Nutrition of adult man and women, lactating and pregnant mother, nutrition at old age

Nutritional requirement of an adult man and woman

Concept of Reference man and woman

Nutritional requirement of a pregnant woman
Physiology of lactation and Nutritional requirements of a lactating mother
Geriatric Nutrition: Nutritional requirements of geriatric people
Assessment of Nutritional status of geriatric population
Nutritional challenges of geriatric age group

References:

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- Pomeranz Yeshuraj, Food Analysis: Theory and Practice.

COURSE CODE: GNPHT- 22

UNIT1: PATHOPHYSIOLOGY AND DIET THERAPY OF GASTROINTESTINAL DISAESES

Dietitian and Diet Therapy:
Concept of Diet Therapy
Role and responsibilities of Dietitian (Administrative, Community, Hospital
Interpersonal relationship with patient, Nutritional counseling)
Routine hospital diet, Regular diet, Light diet, Soft Diet, Full liquid diet
Gastrointestinal diseases and disorders and their management:
Basic structure and function of human digestive system and enzymes
Gastrointestinal diseases and disorders: Diarrhoea, Constipation, Peptic ulcer, Irritable bowel syndrome, Malabsorption Syndrome, Lactose intolerance, Protein-losing enteropathy. Diagnostic Tests for the G.I. diseases and Medical Nutrition Therapy (MNT) for gastrointestinal tract diseases/disorders

Liver-diseases and diet-therapy
Liver diseases: Viral Hepatitis, Cirrhosis of liver, Hepatic encephalopathy, Wilson's disease; Liver function Test. Dietary care and management in liver-diseases
Nutrition in critical care:
Short-term feeding methods (Nasogastric, Nasoduodenal, Nasojejunal methods of delivery–Bolus, gravity, pump, Formula feed and long-term feeding methods of Enteral Nutrition
Advantages and disadvantages and complications of enteral nutrition. Types of Total Parenteral Nutrition (TPN) and Peripheral Parenteral Nutrition (PPN). Composition of parenteral nutrition solutions. Advantages, Disadvantages and Complications of parenteral nutrition, Nutritional support in burns

UNIT 2: PATHOPHYSIOLOGY AND DIET THERAPY OF HEART AND KIDNEY DISEASES, DIABETES AND NEOPLASTIC DISORDERS

Diseases of cardiovascular system:
Hypertension and its pathophysiology, Dyslipidemia and its types, Pathophysiology of Atherosclerosis, Arteriosclerosis, Ischemic heart disease and Myocardial infarction
Heart failure, Cardiomyopathy, Stroke, Risk-factors (blood lipids, hypertension, obesity, diabetes, hyperlipidemias, smoking, and stress), Nutrient guidelines and diet therapy of heart diseases
***Kidney diseases*:**
Acute kidney injury, Chronic renal failure and its different stages, Glomerular Diseases (Nephritic syndrome and nephrotic syndrome), Renal stone and Nephrolithiasis, Medical Nutrition Therapy for different kidney disease
Diabetes:
Types of Diabetes (Type 1, Type 2, Impaired Glucose regulation, Gestational diabetes); Symptoms, Diagnosis (OGTT, Urinary sugar, Blood glucose, Glycosylated Hemoglobin); Complications (Hypoglycemia, Ketoacidosis, Infections, Heart disease and kidney disease). Diet in Diabetes, Recommended Calorie intake and intake of carbohydrates, proteins, fats, vitamins/minerals, Role of fruits and vegetables, dietary fiber, fenugreek seeds for Diabetics. Dietary Guidelines, Glycemic Index, Role of other factors (Exercise, Drugs, Education)
Neoplastic disorders*:*
Definition of neoplasia and different types of neoplastic diseases, Cancer cacehexia and its pathophysiology, MNT for Neoplastic disorders

References:

- Mahan, L. K. and Escott Stump. S. (2008) Krause's Food & Nutrition Therapy 12th ed. Saunders-Elsevier
- Shils, M.E., Shike, M, Ross, A.C., Caballero B and Cousins RJ (2005) Modern Nutrition in Health and Disease. 10th ed. Lipincott, William and Wilkins.
- Gibney MJ, Elia M, Ljungqvist & Dowsett J. (2005) Clinical Nutrition. The Nutrition Society Textbook Series. Blackwell Publishing Company
- Garrow, J.S., James, W.P.T. and Ralph, A. (2000) Human Nutrition and Dietetics. 10th ed. Churchill Livingstone.

- Marian M, Russel M, Shikora SA. (2008) Clinical Nutrition for Surgical Patients. Jones and Bartlett Publishers.
- Vinay Kumar, Abul K. Abbas, Nelson Fausto and Jon Aster; Robbins & Cotran Pathologic Basis of Disease. 8th Edition. Publisher: Elsevier.
- Jo Ann Zerwekh, AZ Jo Carol Claborn, Tom Gaglione; Mosby's Pathophysiology Memory Note Cards: Visual, Mnemonic, and Memory Aids for Nurses, 2nd Edition. Publisher: Elsevier.
- Richard Mitchell, Vinay Kumar, Abul K. Abbas, Nelson Fausto and Jon Aste; Pocket Companion to Robins & Cortan Pathological Basis of Disease. 8th Edition. Publisher: Elsevier.
- Kathryn L. McCance & Sue E. Huether; Pathophysiology: The Biologic Basis for Diseasein Adults and Children. Publisher: Elsevier.
- By Porth, Carol; Essentials of Pathophysiology; Concepts of Altered Health States. Publisher Lippincott Williams & Wilkins.
- Sue E Huether, Kathryn RN; Understanding Pathophysiology. 5th Edition. Publisher: Elsevier.
- Humphrey P. Rang, Maureen M. Dale, James M. Ritter, Rod J. Flower, Graeme Henderson; Rang & Dale's Pharmacology, 7th Edition. Publisher: Elsevier.
- K D Tripathi; Essentials of Medical Pharmacology. 6th edition Publisher Jaypee.

COURSE CODE: GNPHT- 23

UNIT-1: BASIC MICROBIOLOGY AND BACTERIOLOGY

History and milestones of Microbiology:

Milestones in microbiology, Contributions of Leeuwenhoek, Koch, Pasteur, Jenner and Flemming. General idea about soil, air, water and food inhabiting microbes

Bacteriology:

Structure and function of capsule, pili, flagella, cell wall, cell membrane, outer membrane, reserve materials and cytoplasmic inclusions.

Bacterial endospore: Structure and properties; Spore–formation and germination. Plasmid and bacterial chromosome

Bacterial Nutrition and Bacteria culture

Nutrition and nutritional types of bacteria; Types of culture media: natural, synthetic, semi-synthetic and selective media; Composition and principles of: Nutrient Agar, MacConkey Agar, Triple-Sugar-Iron Agar, Pseudomonas Isolation Agar, Blood Agar, XLD agar, Mannitol Salt Agar

Pure culture techniques, Batch culture, continuous culture and synchronous culture; Phases of growth, Kinetics of growth, generation time; Environmental factors influencing growth (Temperature, pH, salt concentration, oxygen, osmotic concentration)

Systemic Microbiology

Classification, phenotypic, biochemical and toxin features, pathogenesis and laboratory diagnosis of: *Staphylococcus*, *Streptococcus*, *Escherichia coli*, *Klebsiella*, *Proteus* and *Pseudomonas*

Bacterial diseases
Microbial virulence, Mode of transmission, pathogenicity, prevention and control of bacterial diseases (Tuberculosis, Cholera, Typhoid, Tetanus, Diphtheria and Anthrax).

UNIT-2: VIROLOGY

Structural organization of viruses
Prions and Viroids
Lytic cycle
Lytic cycle of bacteriophages with reference to *E. coli* and T4
Structure and life-cycle of λ Phage virus and control
Lysogeny
Mechanism of lysogeny; Lysogenic conversion, induction and significance
Viral diseases
Mode of transmission, pathogenicity and prevention of viral diseases:
Dengue, Influenza, JE and Yellow fever, Mumps, Measles, Rabies, AIDS
Coronavirus disease (COVID-19) and herd immunity

References:

- Dimmock, N. J. and Primrose, S. B. (1994). *Introduction to Modern Virology*. 4th ed. Blackwell Scientific Publications. London.
- Williams and Wilkins. *Bergey's Manual of Determinative Bacteriology*. 9th ed. Baltimore (MD):
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- Stanier, R. Y., Adelberg, E. A. and Ingraham, J. L. (1986). *General Microbiology*. 5th ed. Macmillan.
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- Tortora, G. J., Funke, B. R., and Case. C. L. (2008). *Microbiology. An Introduction*. 9th ed.
- Menlo Park Calif. Voyleys, B. A. (2002). Benjamin/Cummings Publishing. *The biology of viruses*. 2nd ed. McGraw-Hill.
- Michael T. Madigan, John M. Brock Biology of Microorganisms, 13th edition (2010), Pearson Publishers.
- Pelczar, Chan and Krieg; Microbiology, 6th edition (1993), McGraw Hill International, ISBN-13: 978-0070492585.

COURSE CODE: GNPHT- 24A

UNIT 1: HEALTH POLICIES

Health Committees and Development of Health Services in Independent India
Constitutional Provisions, Federal Structure and Social Security
National Health Policies (1983, 2002, 2017), Population Policy, Nutrition Policy
Policy on Indian Systems of Medicine and Homeopathy, 2002
Important Health Legislations in India
Health Infrastructure in India—Public, Private, and Charitable, Public Private Partnership (PPP)
Health financing and Health insurance
Civil society and Social Movements in Health
Health for All approaches- Primary Health Care (1978) to Universal Health Coverage
Millennium Development Goals (MDG) and Sustainable Development Goals (SDG)

Information and Communication Technology (ICT)

Objectives of using ICT in higher education, Terminology in ICT
Strengths and limitations of ICT
Major ICT learning in categories
Digital initiative in higher education
Basic concept of computer programming, internet, e-mail account
E-Government and E-Governance

UNIT-2: HEALTH EDUCATION AND HEALTH PROGRAMMES

Health Education

Methods, modes and barriers of communication
Planning, management and organization of health education programs
E-medicine, distance education and associated legal issues
Role of media in health education
E- health and M-health

Health programmes

Integrated Child Development Services (ICDS)
Mind-day Meal (MDM) programme
Clinical Management – Severe Acute Malnutrition (CM-SAM)
State Level Nutrition programs
Vitamin A prophylaxis, Iron and Folic Acid Supplementation
Double Fortification of Salt (DFS) with iron and iodine
National Centre for Disease Control (NCDC)
National Rural Health Mission (NRHM)
National Urban Health Mission (NUHM)
National Vector Borne Disease Control Programme (NVBDCP)
Revised National Tuberculosis Control Programme (RNTCP)

References:

- In-line/Online: Fundamentals of the Internet and the World Wide Web, 2/e – by Raymond Greenlaw and Ellen Hepp, Publishers: TMH
- Information Technology – The breaking wave, Dennis P. Curtin, Kim Foley, Kunai Sen and Cathleen Morin, TMH.
- Internet technology and Web design, ISRD group, TMH
- Rajinikanth AM, Jaypee Brothers, 2010.Counseling Skills for Health Care Professionals, 1st Edition.
- Kevin B. Wright, Lisa Sparks, H. Dan O'Hair, Health Communication in the 21st Century, Blackwell publishing limited, 2013, first edition.
- R.D. Karma, Health Communication Published by Mohit Publications 2008.
- Renata Schiavo, Health Communication: From Theory to Practice, Published by Jossey Bash.
- Goel S L. 2001. Health Care System and Management: Primary Health Care management. Deep & Deep Publications: New Delhi. Vol 4 Oxford Textbook of Public Health, 4th Ed.
- Park K: 2005. Text Book of Preventive and Social Medicine. Banarsi das Bhanot Publishers: Jabalpur. 18th Ed.

COURSE CODE: GNPHT- 24B

UNIT-1: SOCIAL MEDICINE

Social sciences and health

Definition, scope, concepts and significance of social, economic, cultural and behavioral factors on health and disease
Social theories of causation of disease
Implications of social structure and socio-economic status for health
Political and economic aspects of health
Health perceptions and behavior
Health economics.
Qualitative research methodology
Social work approach in health care

UNIT-2: RURAL HEALTH

Sanitation & Water Supply

Problem in environmental sanitation
Introduction to rural ecology and environment, housing ventilation
Drinking water disposal of human, animal waste

Drinking Water

Physicochemical and microbiological analysis of the quality of water
Methods of infection of water and mode of transmission of water-borne diseases
Rural water supply schemes & their implementation

Various appropriate technologies for providing potable drinking water

Rural Waste Management

Necessity of Systematic collection and disposal of waste

Brief description of sewage disposal system sewerage system

Snakes and snake bite management

Poisonous and non-poisonous snakes, snake venoms and their properties, snake-bites and snake-bite management

References:

- S.B Verma, S.K. Jiloka, A.C. Pathak, Rural Health Care and Housing, Deep & Deep Pub. New Delhi
- G.K. Ghosh, Water of Inida (Quality and Quantity), APH Publishing, New Delhi
- M. Dinesh Kumar, Water Management in India, Gyan Publishing House, New Delhi
- Rajiv K. Sinha, Er. Ambuj K. Sinha, Waste Management, INA Shri Publisher, Jaypur
- U.S. Sree Ramulu, Management of Water Resources in Agriculture, New Age International Publisher, N. Delhi
- Suresh Sharma, Health Problems of Rural Population in India, APH Publishing corporation N. Delhi

COURSE CODE: GNPHP- 25: PRACTICAL

Time: 6 hrs.

1. Preparation of normal diets for infant (Dahl soup).
2. Preparation of normal diets for preschool children (Dalia).
3. Preparation of normal diets for college student (Suji Upma).
4. Preparation of normal diets for pregnant lady and lactating mother (Khicheri with mixed vegetables).
5. Simple staining of bacteria and study of cell types; differential staining: Simple Staining, Gram staining, Endospore staining
6. Preparation of liquid media (broth) and solid media for routine cultivation of bacteria.
7. Preparation of slant and stab
8. Pure culture techniques: Spread plate, pour plate and streak plate
9. Isolation and enumeration of bacteria from natural source: soil/ water/food
10. Biochemical tests for characterization: Catalase, Nitrate reduction, Indole production, Methyl red and Voges–Proskauer test, Oxidase test
11. Antibiotic sensitivity test
12. Microbiological analysis of water and milk
13. Preparation of sanitizer
14. Laboratory records
15. Viva-voce

SEMESTER -III

COURSE CODE: GNPHT- 31

UNIT-1: EPIDEMIOLOGY AND DISEASE ECOLOGY

Principles of Epidemiology:

Definition and concepts of epidemiology and epidemiology of diseases, Types of Epidemiology, Uses of Epidemiology. Epidemiological measures: Rates - ratio – proportions, Standardization of rates (direct/indirect). Association and causation (spurious, direct/indirect). Screening for disease (types and uses, sensitivity, specificity, positive and negative predictive values)

Epidemiological Methods:

Descriptive, Analytical, Experiment Studies, Association and Causation

Epidemiology of communicable diseases:

Malaria:

Prevalent major epidemiological types of malaria. Factors responsible for malaria transmission. Basic reproduction rate, vectorial capacity, vector competence, inoculation rate, stability index, Human Blood Index (HBI), Annual Parasite Incidence (API), Slide Positivity Rate (SPR), Slide Falciparum Rate (SFR), Annual Blood Examination Rate (ABER) and endemicity

Amoebiasis:

Agent factors (agent, reservoir of infection, period of communicability), host factors and environmental factors of amoebiasis. Primary prevention (sanitation, water supply, food hygiene and health education) and secondary prevention (early diagnosis and treatment) of amoebiasis

Filariasis

Factors responsible for the transmission of lymphatic filariasis. Infection and infectivity, Microfilaria (Mf) prevalence, Annual Transmission Potential (ATP), Risk of Infection Index (RII)

Dengue

Agent factors and environmental factors for Dengue transmission. Vector indices (dusk index, house Index, container Index, Breteau Index, pupal Index), Minimum Infection Rate (MIR). Epidemiology and risk factors of Classical dengue fever, Dengue haemorrhagic fever (DHF) and Dengue shock syndrome

Tuberculosis

Epidemiological indices of tuberculosis (Agent factors, host factors, social factors of tuberculosis) Risk factors (malnutrition and tuberculosis, HIV and tuberculosis, diabetes and tuberculosis, drug resistance). Aims and objectives of RNTCP, BCG vaccination, DOTS strategy

Cholera

Epidemiological determinants of cholera (agent factors, carriers, host-factors and environmental factors), Chemoprophylaxis and Diarrhoeal Diseases Control Programme

Typhoid

Epidemiological determinants and social factors of typhoid, Management of typhoid

(control of reservoir, control of sanitation and immunization)

Viral Hepatitis

Epidemiological determinants of Hepatitis A, B & C (agent factors, host factors and environmental factors, High risk groups). Prevention and containment

AIDS

Epidemiological features of AIDS (agent factors, host factors, high-risk groups, immunological disorders), Opportunistic infections (Tuberculosis and Kaposi sarcoma, candidiasis, toxoplasmosis, herpes zoster, herpes simplex, coccidiomycosis, cryptosporidiosis). WHO case definition for AIDS surveillance and control strategy

UNIT-2: PARASITOLOGY

Protozoology

Classification of parasitic Protozoa

Amoebiasis*:*

General account, morphology, life-cycle and metabolism of *Entamoeba histolytica*. Virulence and virulent factors (Gal/GalNAc lectin, amebapore and proteases), pathogenesis, laboratory diagnosis and control of *Entamoeba histolytica*

Giardiasis:

General account, morphology, life-cycle, pathogenesis, laboratory diagnosis and control of *Giardia lamblia*

Trypanosomiasis and human sleeping sickness:

Trypanosomes infecting human beings. Morphological stages, life-cycle, clinical features and control of *Trypanosoma brucei gambiense* and *Trypanosoma cruzi*

Leishmaniasis and Kala-azar*:*

Forms of Leishmaniasis (visceral, cutaneous and mucocutaneous), Post-Kala-azar Dermal Leishmaniasis (PKDL), General account, morphology, life-cycle, Virulence and virulent factors, immuno-pathogenesis, laboratory diagnosis and control of *Leishmania donovani*

Malaria and Malarial parasites

History and geographic distribution of human malaria (Global and India). Taxonomic position of different malaria parasites – Distinguishing characters of different species of human malarial parasites, Brief description of zoonotic malarial parasites. Morphology and life cycle of *Plasmodium vivax* and *Plasmodium falciparum.* Immuno-pathogenesis of malaria: Host cell-parasite interactions; Factors affecting natural immunity in host's body against malaria (Glucose-6-Phosphate- Dehydrogenase deficiency, Sickle-cell-trait, HBE, Duffy-negativity, ovalocytosis). Clinical features, laboratory diagnosis, treatment, prevention and control of malaria.

Helminthology

Classification of parasitic helminthes

General characteristics of the Cestoda, Trematoda and Nematoda

Morphology, life history, pathogenicity and control:

Paragonimus westermani, Schistosoma haematobium, Diphyllobothrium latum, Taenia saginata, Ascaris lumbricoides, Trichinella spiralis

Filariasis:

Lymphatic Filarial Parasites: History and geographic distribution of lymphatic filariasis (Global and India), Taxonomic position of different human filarial parasites,

Distinguishing characters of different species/strains, General account, structure, life-cycle, pathogenicity, laboratory diagnosis and control of *Wuchereria bancrofti* and *Brugia malayi*

References:

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- Owen AY and Frankle RT (1986). Nutrition in the Community, The Art of Delivering Services, 2nd Edition, Times Mirror/Mosby.
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- Roday, S. (1999) Food Hygiene and Sanitation. 1st Edition, Tata McGraw Hill, New Delhi.
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- Gibney M.J., Margetts, B.M., Kearney, J. M. Arab, I., (Eds) (2004) Public Health Nutrition, NS Blackwell Publishing.
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- Hati, A. K. (2001). *Medical Parasitology*. Allied Book Agency, Kolkata.
- Hyman, L. H. (1951). *The Invertebrates*. (Vols- II, III) Mc.Graw Hill Book Company.
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- Smyth, J. D. (1994). *Animal Parasitology*. 3rd ed. Cambridge University Press.
- Soulsby, E. J. L. (1982). *Helminths, Arthropods and Protozoa of domesticated animals*. ELBS and Bailliere Tindall.
- Smyth, J. D. and McManus, D. P. (1989). *The Physiology and Biochemistry of cestodes*. Cambridge Univ. Press.

COURSE CODE: GNPHT- 32

UNIT 1: ANTHROPOMETRY

Basic tools for anthropometry

Weight for age, height for age, weight for height of different age groups
Body Mass Index (BMI), Mid-upper-arm circumference, head circumference, chest circumference of different age groups
Body fat assessment in different zone
Muscle mass assessment, waist hip ratio and its importance
Skinfold thickness in different age group
Resting energy expenditure from height, weight and others parameters

Nutritional assessment of children

Management of severe acute malnutrition in children
Feeding problems of children with special health care needs – cleft palate, craniofacial anomalies, neuro-developmental disorders

UNIT-2: BIOCHEMICAL ASSESSMENT OF NUTRITIONAL STATUS

Body composition and Biochemical Assessment

Fat mass index, muscle mass index
Bone density, T score, Z score, Water Index
Methods of calculation of body composition
Bioimpedance and its application in BCM analysis

Biochemical parameters of nutritional status

Indicators of protein-energy status, Indicators of PEW, Anemia
Bio chemical indicators for Immune dysfunction
Biochemical indicators for CVD risk and oxidative stress
Urine and stool analyses

Assessment of Nutritional Status

Subjective Global Assessment (SGA)

References:

- Cameron N. (1984). The measurement of Human Growth. Croom Helm Ltd. London and Sydney.
- Curry KA & Jaffe A (1998) Nutrition Counseling Skills & Communication Skills. WB Saunders & Co.
- Gibney MJ, Elia M, Ljungqvist & Dowsett J. (2005) Clinical Nutrition. The Nutrition Society Textbook Series. Blackwell Publishing Company
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- Snetselaar LG (2009) Nutrition Counseling Skills for the Nutrition Care Process. James & Bartlett Pub.
- WHO (2006).WHO Child growth standards: Length/height for age, weight for age, weight for length, weight for height and body mass index (2006). Available at http:// www.who.int.
- WHO (2007).WHO Reference Data for Children and Adolescents (5-19 years). WHO reference. Available at http://www.who.int/growthref/en/
- WHO (2009). WHO Child growth standards: Growth velocity based on weight, length and head circumference Available at http://www. who.int

COURSE CODE: GNPHT-33

UNIT 1: FOOD MICROBIOLOGY AND FOOD BORNE DISESAES

Fermented foods:
Definition of fermented food
Types of fermented foods
Biological importance of fermented foods, Microbial diversity of fermented foods
Milk & Dairy technology:
Pasteurization, homogenization of milk
Manufacture of milk products like condensed and dried milk, cream, butter, ghee, ice cream, cheese
Fortification of milk products
Probiotics:
Taxonomy and Biology of Probiotics
Role of Probiotic bacteria in human and animal health
Role in lactose metabolism, Antimutagenic and antitumour activities, Stimulation of immunity, Prebiotics and Probiotics in infant formulae, Probiotics and Prebiotics in elderly individuals, Prebiotics and Probiotics in companion animal nutrition
Food-borne diseases and food poisoning
Mode of transmission, pathogenesis and control of:
Staphylococcal enteritis, Botulism
Bacillus cereus enteritis, Salmonellosis
Shigellosis, *Vibrio* enteritis
Listeriosis, *Escherichia* enteritis
Campylobacteriosis and Perfringens enterotoxemia

Prevention measures for food-poisoning and spoilage
Preventing the incorporation of microbes into food
Preventing the survival or multiplication of microbes in food (temperature and food preservation, irradiation and chemical preservation)

UNIT-2: FOOD TOXICANTS AND FOOD HYGIENE

Food toxicants:
Neuro lathyrism, Aflatoxins, Ergot, Epidemic dropsy, Endemic ascites, Fusarium toxins
Food allergies:
Clinical manifestations of food allergy:
Food adulteration:
Adulterants in commonly consumed food items, Common adulterants in food and their effects on health, house hold methods to detect adulterants in food
Sanitation and hygiene
Importance of sanitation and hygiene in food, kitchen hygiene, food plant hygiene, food laws.
Indices of food, milk and water: Sanitary quality, Microbiological criteria of foods, water and milk testing (Bacteriological analysis).
Milk hygiene
Sources of infection, Milk-borne diseases, Clean and safe milk, Pasteurization of milk, Tests for pasteurized milk
Meat hygiene
Meat inspection, slaughter houses. Fish hygiene, sign of a fresh fish, Fish poisoning
Hygienic handling of Food
Precaution to be taken while handling pesticides
Food laws:
Prevention of Food Adulteration (PFA) Act. Regulating authority-Fruit Products Order (FPO), Meat Products Order (MPO), Bureau of Indian Standards (BIS), MMPO, FSSAI, ISI, Agmark. Prevention of Food Adulteration Act (PFA), Milk and Milk Products Order (MMPO), Meat Food Products Order (MFPO), Fruits Products Order (FPO).

References:

- Kent N L. (1993) Technology of Cereals. 4th Edi. Pergamon Press.
- Olson, V M; Shemwell G A and Pasch, S (1998) Egg and Poultry Meat Processing, VCH P, New York
- Winton & Winton, (1991) Techniques of Food Analysis. Allied Scientific Publishers.
- Fellows P J (2002), Food Processing Technology- Principles and Practices, 2nd Edition. Woodhead Publishing Ltd. port.
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- Banwart GJ (1987) Basic Food Microbiology. CBS Publishers and Distributors.
- Frazier WC, Westoff DC. (1998) Food Microbiology. 4th ed. Tata McGraw Hill Publishing Co. Ltd.
- Jay JM, Loessner DA, Martin J. (2005) Modern Food Microbiology. 7th ed. Springer.
- Prescott LM, Harley JP, Klein DA. (2008) Microbiology. 6th ed. WMC Brown Publishers.
- Schmidt, RH. Roderick, Food Safety Handbook, G.E. Wiley interscience, 2003, New Jersey.
- Siddapa, G S(1986) Preservation of Fruits and Vegetables, ICAR Publication
- Van Loesecke HW (1998), Food Technology Series Drying and Dehydration of foods. Allie Scientific Publishers
- Salikhe D K and Kadam S S (1995), Handbook of fruit science and technology. Production Composition, Storage and processing. Marcel Decker inc, New York
- Marriott N G (1985), Principles of Food Sanitation 1st Edition. A VI publication USA.
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- Mahindru, S N (2000) Food Additives- Characteristics Detection and Estimation. Tata Mc Graw Hill Publishing Co. Ltd

COURSE CODE: GNPHT-34A

UNIT-1: CELL BIOLOGY

Cell Theory and Introduction to Cell Biology

History and breakthroughs in cell biology

Properties and behaviour of cells, diversity of cell types

Differences and similarities in the basic structure and functioning of prokaryotic and eukaryotic cells

Biological membrane

Composition of biological membranes: Lipids and lipid modification, membrane proteins

Functions of cell membrane

Cell organelles

Structure, function and diseases associated with cell organelles such as nucleus, mitochondria, ER, Golgi

Bio-Instrumentation (Principles and applications)

Microscopy (Light and Electron Microscopy), Centrifugation, Chromatography, Gel-Electrophoresis, PCR, RT-PCR, (ELISA) and Blotting Techniques

Ultrasonography, ECG, Eco-Cardiograph, MRI and CT scan

UNIT-2: IMMUNOLOGY

Cells and organs of the immune system:
Leucocytes, APC, Macrophage-cell and B-cell, Mast cell, Dendritic cell and APC, NK cells Structure and Function of MHC.
Types of antigen and antibodies:
Definition and properties of antigenic determinants of immunoglobulin (Isotype, allotype & idiotype) Structure, classes and biological activities of antibodies
Antigenic determinants
Types of immune response:
Innate and acquired Immunity, Humoral and Cellular Immunity
Vaccination and Immunization schedule:
Types of vaccines
National immunization schedule

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- *McConkey, H. (1993). Human Genetics: The molecular Revolution. Jones and Bartlett Publishers.*
- *Snustad, D. P. and Simmons. M. J. (2004). Principles of Genetics. 4th ed. John Wiley and Sons.*
- *Stansfield, W. D. (1991). Schaum's Outline Series: Theory and Problems of Genetics. 3rd ed. McGraw-Hill.*
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COURSE CODE: GNPHT-34B

UNIT-1: MICROBIAL GENETICS

Basics of Nucleic acid structure & Function
Structure and function of DNA & RNA
Plasmids
Types of plasmids (F Plasmid: Conjugate plasmid and non-conjugative plasmid, R plasmid, Col plasmid, Copy number and incompatibility); Episomes
Transposable elements: Insertion sequence and transposons, Integrons and Antibiotic-Resistance cassettes, Multiple Antibiotic Resistant bacteria
Gene transfer in microorganisms: Conjugation, Transformation and Transduction (Generalized transduction and Specialized Transduction)
Replication, Transcription, Translation
DNA replication, Transcription, Translation in *E.coli*
Gene expression and regulation

UNIT-2. ANIMAL AND HUMAN GENETICS

Structure of eukaryotic DNA; Histone proteins, Nucleosome
Molecular organization of DNA in chromosomes.
Heterochromatin and Euchromatin.
Human mitochondrial DNA
DNA replication, Transcription, Translation, Control of gene expression – Eukaryotic
Mechanism of sex determination, Sex linked inheritance, Linkage and crossing over
Genetic diseases
Monogenic diseases – Thalassemia, Albinism, Haemophilia, Colour blindness
Polygenic diseases- Hyperlipidemia, Diabetes mellitus
Genetic basis of Bovine spongiform encephalopathy (BSE)
Genetic basis of Myocardial Infarction
Genetic syndromes
Down syndrome, Turner syndrome, and Klinefelter syndrome

Genetic screening and counseling

Prenatal and Post-natal screening of genetic diseases
Amniocentesis, Chronic Villus sampling
Family screening for genetic diseases; Scope of genetic counseling

Bio-Instrumentation (Principles and applications)

Microscopy (Light and Electron Microscopy), Centrifugation, Chromatography, Gel-Electrophoresis, PCR, RT-PCR, (ELISA) and Blotting Techniques
Ultrasonography, ECG, Eco-Cardiograph, MRI and CT scan

References:

- Abbas, A. K., Lichtman, A. H. and Pillai, S. (2006). *Cellular and molecular Immunology*. 6th ed. Saunders.
- Alberts, B., Johnson, A. Lewis J., Raff, M., Roberts, K. and Walter, P. (2008). *Molecular Biology of the Cell*. 5th Ed. Garland Publishing House.
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- *Hartl, D. L. and Jones, E. W. (2006). Essential Genetics: a genomics perspective. 4th ed. Jones and Bartlett Publishers, Boston.*
- *Lewin, B. (2008). Genes IX. Jones and Bartlett Publishers.*
- *Watson, J. D., Baker, T. A. and Bell, S. P. (2007). Molecular Biology of the Gene. 6th ed. Benjamin Cummings.*
- *Malacinski, G. M. (2003). Essentials of Molecular Biology. 4th ed. Jones and Bartlett.*
- *McConkey, H. (1993). Human Genetics: The molecular Revolution. Jones and Bartlett Publishers.*
- *Snustad, D. P. and Simmons. M. J. (2004). Principles of Genetics. 4th ed. John Wiley and Sons.*
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- *Tamarin, R. H. (2004). Principles of Genetics. Tata McGraw-Hill Publishing Comp. Ltd.*

COURSE CODE: GNPHP- 35: PRACTICAL
Time: 6 hrs.

1.Anthropometry: Height, weight, circumference of chest, Mid-upper-arm circumference
2.Comparison with norms and interpretation of the nutritional assessment data and its significance-Weight forage, height forage, weight for height
3.Body Mass Index (BMI), Waist-Hip Ratio (WHR)
4.Diet Chart preparation of a person suffering from Protein Energy Malnutrition.
5.Diet Chart preparation for fevers and infections.
6.Diet Chart preparation of a person suffering from Gastrointestinal disease, Liver-disease, Diabetes, Heart-disease, kidney disease
7. Drawing and staining of blood films for parasitic Protozoa and microfilaria
8. Whole mount preparation of trematode and arthropod parasites
9. Staining of scolex and proglottids of cestodes
10.Whole mount preparation of mosquito vectors (*Anopheles, Culex* and *Aedes*)
11. Identification of parasites and vectors (Slides/ Photographs)
12. Retrieval of parasite nucleic acid /protein sequence from Nucleic acid/Protein Data Base/Parasite Data-Base, Alignment of parasite DNA /Protein sequence
13.Submission of Laboratory Records
14.Viva-voce

SEMESTER-IV

COURSE CODE: GNPHT-41:

UNIT-1: MEDICAL ENTOMOLOGY AND VECTOR BIOLOGY

Mosquitoes of public health importance:
Life cycle, mating, host seeking, feeding, resting, oviposition behaviour – longevity, gonotrophic cycle, fecundity. Salient features and distribution of important vector species of *Anopheles* (*An. stephensi, An. culicifacies, An. fluviatilis*), *Aedes* (*Ae. aegypti, Ae. albopictus*), *Culex* (*Cx. quinquefasciatus, Cx. tritaeniorhynchus*), *Mansonia* (*Ma. annulifera, Ma. uniformis*).

Sand flies
Salient features and distribution and medical importance of *Phlebotomus*

Medical importance:
Fleas, Black fly, Bed bugs, Head louse, Body louse, Ticks and Mites

Life-cycle, pathogenesis and control of vector borne diseases:
Malaria, Lymphatic filarisis, Dengue and Japanese Encephalitis

UNIT-2: VECTOR -CONTROL

Vector Ecology and Population Dynamics
Introduction to vector ecology and Ecosystem, habits and habitat – Population interaction with abiotic and biotic factors – dispersal and migration; natality, mortality, survivorship

Vector control by Biological agents
Animal predators, Larvivorous fish and plant extracts and plant derived oils.

Vector-Parasite and Vector-Microbe interaction
Mosquito –*Plasmodium* interaction, Mosquito-*Wuchereria* interaction
Symbiotic association of microbes with vectors. Insect-pathogen relationship
Factors affecting the pathogenicity of insect vectors

Vector control by Microbial pesticides
General properties, types and properties of toxins and mode of action of *Bacillus thuringiensis, Bacillus sphaericus*
Role of nuclear polyhedrosis virus and plant extracts as controlling agents of vectors

Endosymbionts and their significance
Wolbachia and its significance

References:

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- World Malaria Report (2010). WHO, Geneva.
- Sustainable Development and Health for all: Building the capacity of National Health authorities, WHO – SEARO, 1999, No.30.

COURSE CODE: GNPHT-42

UNIT-1: ENVIRONMENTAL BIOLOGY

Ecosystem structure and functions:

Structures – Biotic and Abiotic components. Functions – energy flow in ecosystems, energy flow models, food chains and food webs. Biogeochemical cycles, Ecological succession. Species diversity, Concept of ecotone, edge effects, ecological habitats and niche. Ecosystem stability and factors affecting stability

Population ecology:

Characteristics of population, concept of carrying capacity, population growth and regulations. Population fluctuations, dispersion and metapopulation. Concept of 'r' and 'k' species. Keystone species

Community ecology:

Definition, community concept, types and interaction – predation, herbivory, parasitism and allelopathy. Biological invasions

Stress on ecosystem and function

Ecosystem health and stress, Biological invasion, biological indicators and their use in monitoring pollution, bioaccumulation and biomagnifications

UNIT -2: ENVIRONMENTAL HEALTH

Air pollution

Sources and types of Pollutants – Natural and anthropogenic sources, primary and secondary pollutants. Impact of air pollutants on human health, plants and materials; Acid rain. Control devices for particulate matter and gaseous pollutants

Water pollution

Types and sources of water pollution. Impact on humans, plants and animals. Measurement of water quality parameters: sampling and analysis for pH, EC, turbidity, TDS, hardness, chlorides, salinity, DO, BOD, COD, nitrates, phosphates, sulphates, heavy metals and organic contaminants. Microbiological analysis – MPN.

Drinking water treatment: Coagulation and flocculation, Sedimentation and Filtration, Disinfection and Softening. Wastewater Treatment: Primary, Secondary and Advanced treatment methods

NoisePollution

Sources, weighting networks, Measurement and analysis of sound; A weighted sound level, Equivalent sound pressure level (Leq), Noise pollution level (NPL), Sound exposure level (SEL), Traffic noise index (TNI), Noise dose and Noise Pollution standards. Impact of noise and vibrations on human health. Noise control and abatement measures: Active and Passive methods

Hazardous waste

Types, characteristics and health impacts

Hazardous waste management: Treatment methods – neutralization, oxidation reduction, precipitation, solidification, stabilization, incineration and final disposal

Pesticides in public health

Advantages and disadvantages of chemical and biological control

Classification and mode of action of insecticides, chemical pesticides, bio-larvicides, insect growth regulators

References:

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- Avinash Tyagi, Climate Change and Global Warming, Rajat Publications 4675/21, Ansari Road, Daryaganj New Delhi- 110002 (India)
- Upadhyay D.S., Cold Climate Hydrometeorology, Wiley Eastern Ltd., 4835/24, Ansari Road, Daryaganj, New Delhi- 110002 (India).
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COURSE CODE: GNPHT-43

UNIT-1: BIOSTATISTICS AND RESEARCH METHODOLOGY

Biostatistics

Types of Sampling, Data types: qualitative-quantitative Sources of Health data
Measurement of Central tendency: Mean, Median, Mode
Dispersions: Range - Mean deviation - Variance - Standard deviation - Standard Error
Chi-square test
Correlation and Regression

Measuring the occurrence of disease

Measures of morbidity - prevalence and incidence rate

Measurement of rate of a disease in a population:

Attack rate, morbidity rate, mortality rates and ratios; Standardized mortality ratio, proportion, two by two tables; Dose response; Diagnostic or screening test; Evaluation

Research methodology

Writing research proposal and report, Purpose of a proposal/report. Content of

proposal/report, Critical review of research report and journal article. Introductory section, methodology adopted, Development of research tools. Protocol preparation, Analysis and inferences. Summary, conclusions and recommendations. References/Bibliography, Appendices, Footnotes

UNIT-2: BIOINFORMATICS AND NUTRIGENOMICS

Bioinformatics:

Concept and applications of Bioinformatics

Genomics and Proteomics

Basic idea of Genomics and Proteomics; Lateral and
Horizontal gene transfer; Orthologous and Paralogous

Data bases:

Nucleic acid Data Bases: Gen Bank of USA, EMBL of Europe, DDBJ of Japan.
Protein Data Bases: PIR, MIPS, SWISS-PROT, TrEMBL, NRL-3D and PDB
Nutrient data bases

Sequence alignments:

Principle, Sequence alignment: Global match, Local match, Motif match Features and types of BLAST
Sequence similarity searching by BLAST
Significance of Multiple Sequence Alignments

Nutrigenomics

Nutritional regulation of gene expression. Epigenomics
Role of specific nutrient in controlling gene expression
Relation between food and medicine in controlling of diseases

References:

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- Rosner B: Fundamentals of Biostatistics, ed. 6, 2006.
- Dunn G, Everitt B: Clinical Biostatistics: An Introduction to Evidence-based Medicine. Edward Arnold, 1995
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- Journal Nutrients 2012, 4, 1898-1944; Molecular Nutrition Research—The Modern Way Of Performing Nutritional Science.
- Journal Nutrients 2013, 5, 32-57; Nutrigenetics and Metabolic Disease: Current Status and Implications for Personalized Nutrition
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- R.W. Old and S. B Primrose, An Introduction to Genetic Engineering6th edition, Blackwell Science Inc.
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COURSE CODE: GNPHP- 44:

- ***Project proposal writing / Review Paper/ Term Paper / Project work and Dissertation/ Internship***
- ***Seminar Presentation [Presentation + viva voce]***

Semester wise examination & Marks distribution*:*

Course	**Units**	**Marks distribution**					
		Total number of questions	Number of questions to be answered	Marks of each question	Marks of Theoretical course of two units	Internal Assessment for each course	Full marks of each Theoretical course of two units
Theoretical course of two units	Unit –1 & Unit -2	*12*	*8 out of 12*	*5*	*5 x 8= 40*	*10*	*50*
For each Theoretical course: *Eight questions (out of twelve) of **5** marks each are to be answered* *Ten marks will be reserved for Internal Assessment for each Theoretical course* *Ten marks will be reserved for Internal Assessment for each Practical course*							