

WEST BENGAL STATE UNIVERSITY
Syllabus of M.Sc. in FOOD AND NUTRITION

Objective : The department of Food & Nutrition offers M.Sc. Course to enrich students with the knowledge of nutrition and its therapeutic aspects as well as Food Biotechnology and Food Processing and its preservation value. The course also covers very recent areas like Molecular Biology, Food Biotechnology and Nutrigenomics. The subject is application oriented and also calls for research in these areas. M.Sc. course exposes students about physiological principles, biochemical and biophysical basis of food and nutrition, micro-nutrients, food biotechnology, community based nutrition, biostatistical based data handling and analysis, dietetics and nutrition planning to train students for food industry, food based biotech industry, food based pharmaceutical industries and nutritionist in hospital based services.

At a glance

Code	Subject	Brief contents	Credits
Semester I			
Theory	Human Physiology – I	Cell, Digestion & absorption, Endocrine, Respiration	4
Theory	Bio-Chemistry – I	Enzymes, Carbohydrate and Fat - chemistry and metabolism	4
Theory	Biophysics	Principles and applications of different biophysical techniques	4
Theory	Biostatistics	Research methodologies and data analysis techniques	4
Practical I	Physiology & Bio-Chemistry	Physiological tissue and different parameters, Different diagnostic assay procedure	4
Semester II			
Theory	Human Physiology – II	Nerve and muscle, Blood and circulation, Immunity and kidney.	4
Theory	Biochemistry – II	Amino acid metabolism, Nucleic acid metabolism	4
Theory	Molecular Biology	Molecular structure and function	4
Theory	Food Biotechnology & Food Processing Technology	Production of GM food, Nutritive value of GM food, Food processing technologies in food industries	4
Practical II	Food Analysis & Food Processing	Chemical constituents of food & Food processing techniques for industrial applications	4
Semester III			
Theory	Nutritional science	Basic nutrition, Role of vitamins and minerals, maternal nutrition, growth & development	4
Theory	Therapeutic Nutrition	Nutritional strategies in diseases	4
Theory	Community Nutrition & Extension Education	Community level nutritional assessment & awareness program for community	4
Theory	Food Microbiology & Food Toxicology	Food borne diseases and food spoilage by microbes, Toxicants present in food	4
Practical III	Dietetics & Food Safety	Dietetics & Meal Planning using different case studies, Food poisoning, Microbial food spoilage, Food Adulteration	4
Semester IV			
Theory	Food Service Management	Various aspects related to food servicing industries	4
Theory	Food Preservation Technology	Food Preservation Technology for food industries	4
Theory	Nutrigenomics & Systems Biology	Application of genomic science to nutrition	4
	Project	Project followed by seminar presentation	8

Semester I

Human Physiology – I (Credit 4)

Cell Physiology: Cell biology- Ultramicroscopic structure of organelles of cell. Transport of nutrients. Active and passive transport mechanisms, glucose transporter. Cell communication: hormones and receptors, second messenger.

Alimentation: Anatomy of alimentary system and entero-hepatic circulation. Digestion and absorption – carbohydrate, protein, lipid. Absorption of water and electrolytes. Regulation of gastrointestinal function – salivary, gastric (Mechanism of HCl secretion- physiological, nutritional and pharmacological aspects), pancreatic, hepatobiliary (Bile formation and secretion), small intestinal. Role of mucosa associated lymphocytes in health and disease. Physiology of obesity and starvation. GI disorders.

Endocrinology: Endocrine function of Pancreas and its role in regulation of metabolism. Thyroid gland – calorogenic function. Adrenal medulla and adrenal cortex - Mechanism of action of steroid and protein hormones. Gastro-intestinal hormones - Site of origin, chemical nature and mode of action. Pituitary – Anterior pituitary (TSH, ACTH, GH), Posterior pituitary (ADH). Hypothalamic control of pituitary. Role of hormones, vitamins and minerals in bone formation. Ovulation and menstrual cycle. Puberty.

Respiration: Mechanism of respiration. Pulmonary function test.

CO: Develop understanding of human physiology from cellular level to organ level function of food assimilation, endocrine control and respiratory function. This course would be foundation of understanding of human system which is pre-requisite of application of nutrition in diseases.

Biochemistry – I (Credit 4)

Enzymes : Classification, specificity, kinetics, factors affecting enzyme activity, enzyme inhibition, coenzymes in metabolism, isozymes, role of vitamins and minerals in the mechanism of enzyme action. enzymes in clinical diagnosis.

Stereochemistry: Basic Stereochemistry, Symmetry element and Symmetry operation, concept of configuration and conformation, DL & RS nomenclature, conformation of cyclic molecule, anomeric effect.

Carbohydrate Chemistry: Introduction, definition, nomenclature, classification, Stereo chemistry general properties of sugar. Identification of common mono, di and polysaccharides. Determination of reducing and non reducing sugars. Chemistry of starch, glycogen, cellulose gums and mucilage, crude fibre. Physiological functions of carbohydrate. Functional properties of sugars and polysaccharides in food.

Carbohydrate Metabolism: - Glycolysis, TCA cycle, gluconeogenesis, glycogenesis, glycogenolysis, HMP pathway, electron transport chain, oxidative phosphorylation (in brief). Inborn errors of Metabolism

Lipids Chemistry: Classification, physical and chemical properties of lipid, soap and fatty acid detergents, essential, fatty acids, fats and oil. saponification value, acid value, iodine value, acetyl value. Reichert Meissal number, oxidative and hydrolytic rancidity, phosphoglycerides, sphingolipids, nonsaponifiable lipids, cholesterol, prostaglandin.

Lipid Metabolism: Oxidation of fatty acids, Fatty acid biosynthesis, metabolism of triglycerols, cholesterol, phospholipids, lipoproteins and eicosanoids, hyperlipoproteinemias, ketosis. Inborn errors of Metabolism

CO: Develop understanding of biochemical linkage between food and nutrition w.r.t. properties of enzymes, carbohydrate and fat chemistry and metabolism.

Biophysics (Credit 4)

Physicochemical properties and biological applications of a) viscosity b) surface tension c) absorption d) photochemistry e) colloids f) osmosis g) Donnan membrane equilibrium, Electrolytic dissociation acid, base, salts, pH, buffers – biological importance.

Photoelectric colorimeter and spectrophotometer.

Different types of electrophoresis apparatus. Western blot, northern blot, southern blot, ELISA, RIA.

Chromatography: Affinity, Adsorption, Gel exclusion and Gas chromatography, High pressure liquid chromatography (HPLC) and Thin layer chromatography (TLC), Paper chromatography.

Spectroscopy – general outline and its application in food analysis.

Laws of Thermodynamics, Entropy and Gibbs' free energy.

Instrumentation: Outline of instrumentation and use of: Phase contrast, ultra- polarising and electron microscope: scanning and transmission, atomic force microscopy.

CO: Course contents help in understanding of physical principles of food and biophysical principles

in physiological functions. It helps students in understanding the procedure of data acquisition.

Biostatistics (Credit 4)

Sampling and data. Frequency distribution. Cumulative frequency. Graphical presentation techniques including Histogram, Bar chart, Pie chart along with the concepts of frequency polygon. Mean, median, mode, Standard Deviation and Standard Error. Coefficient of variation. Probability theory- Introduction to the Classical & Frequency definition of probability. Elementary problems on simple and conditional probability. Theoretical distributions- Binomial, Poisson, Normal.

Parametric and nonparametric statistics. t-distribution and F-distribution. Mann-Whitney U test. Chi-square distribution.

Statistical Inference- Statistical hypothesis testing, Null hypothesis & alternative Hypothesis, Critical region, Type- I & Type II error, Level of significance.

Correlation and Regression Analysis. Analysis of variance.

CO: Course contents helps in understanding of physiological data handling and its manipulation and analysis.

Practical – I Physiology & Bio-Chemistry (Credit 2+2 = 4)

a. Physiology

1. Staining of tissue sections and identification.
2. Observation of human tissue.
3. Preparation of human blood film, Differential and Arneeth count.
4. Staining and identification of squamous and epithelial tissue.
5. Identification of different anatomical parts of human organs.
6. Determination of Physical fitness index.
7. Determination of Heart rate and Blood pressure in human.
8. Antigen -antibody interaction assay
9. Cross-matching test with human blood.
10. Pulmonary function test.

Molecular Physiology: subcellular fractionation, cellular membrane (RBC Ghost).

b. Bio-Chemistry

1. Determination of Enzyme Activity:
 - a. Serum amylase, b. Alkaline and acid phosphatase activity in plasma, c. SGOT and SGPT, d. Serum lipase activity, e. Enzyme kinetics in relation to temperature and pH and substrate.
2. Estimation of Total Serum protein content by the Biuret method & Lowry method.
3. Estimation of serum cholesterol.
4. Estimation of HDL and LDL in serum.
5. Estimation of vitamin in serum (vitamin C, vitamin A and vitamin B12).
6. Estimation of mineral in serum (calcium, sodium, potassium)
7. Estimation of metabolites in Blood (urea, uric acid, and creatinine).
8. Separation of biological samples by chromatographic method.

CO: This helps students to understand the principles of different physiological and biochemical techniques. This is the pre-requisite of developing dietary and nutritional protocols in clinical conditions.

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Semester II

Human Physiology – II (Credit 4)

Nerve & Muscle physiology: Excitable tissue – nerve and muscle. Resting membrane potential, action potential, nerve impulse propagation. Synaptic and Neuromuscular transmission. Anatomy of nervous system. Central regulation of visceral function. Function of hypothalamus – hunger, satiety and thirst. Neuroendocrine regulation of hunger and satiety - Leptin, Ghrelin. Neural basis of behavior and emotion. Chemical sense – smell and taste.

Hematology: Body fluids – blood and lymph. Blood cell formation. Different hematological parameters.

Immunology: Cells and organs of immune system. Innate immunity and acquired immunity, antigen, hapten and allergen. Immunoglobulins- different isotypes. Antigen-Antibody interactions. T cell cytotoxicity. Cell mediated effectors function, Cytokines, Hypersensitivity reactions. Autoimmunity- autoimmune diseases, Immunodeficiency disorder. Food Allergy.

Circulation: Role of heart in circulation. Cardiac output. Role of circulation in distribution of nutrients and excreta - Systemic, Splanchnic, cerebral and coronary.

Kidney: Structure of nephron, filtering membrane, Role of kidney in maintaining electrolyte balance. Buffer system of body (lung and kidney). Diuretics, kidney stone.

Physiology of lactating, pregnant, athlete and geriatric human being.

CO: A detail knowledge of neural regulation, immunity and excretion. This course would be foundation of therapeutic nutrition.

Biochemistry – II (Credit 4)

Proteins and Amino acids: Physical and chemical properties of amino acid and protein. Structure and conformation of protein. Protein sequencing. Distribution, amount and functions of protein in food. functional properties, effect of processing.

Enzyme Chemistry: Mechanism of enzyme action. Role of vitamins and minerals in enzyme action.

Amino acid Metabolism:- Essential amino acids. Transamination. Deamination. Transmethylation. Decarboxylation. glucogenic and ketogenic amino acids. Metabolism of lysine, phenylalanine, valine, glutamic acid, urea cycle, synthesis of serotonin, histamine, dopamine, GABA. Inborn errors of Metabolism.

Nucleic acid metabolism: structure of purine and pyrimidine, Purine and pyrimidine metabolism.

CO: Develop understanding of biochemical linkage between food and nutrition w.r.t. 3D structure of protein w.r.t function, protein and nucleic acid chemistry and metabolism.

Molecular Biology (Credit 4)

Molecular Physiology: Structure and types of DNA and RNA, Nucleic acid sequencing. Replication. Transcription. Translation. Lac operon. Transposon. Recombination. Maternal inheritance.

Genetic engineering: recombinant DNA technology. Plasmids, cosmids and bacteriophage based vectors for cDNA and genomic libraries. Principles and methods of protein and genetic engineering and gene targeting. PCR.

CO: Develop understanding molecular basis of life and different molecular techniques. Molecular basis becomes the seed for public health and biotechnology industry.

Food Biotechnology & Food Processing Technology (Credit 4)

Genetically modified food for nutritional enhancement: principles, techniques, problem, prospects, and ethics. Development of beta-carotene enhanced food crops. Genetic engineering- driven enhancement of food crop yield, productivity, sustainability, nutritional quality and adequacy. Assessment of GM food in relation to human health.

Vitamins and Minerals: - Losses of vitamins and minerals due to processing.

Fish, Meat & Poultry processing technology – fish sauce, fish liver oil, fish meat, fish flour, meat sausage, ham, bacon, etc., egg processing.

Milk & Dairy technology – pasteurization, homogenization of milk, manufacture of milk products like condensed and dried milk, cream, butter, ghee, icecream, cheese, fortification of milk products.

Fruits & vegetables processing – beverages, soft drinks, fruit juice, wine, beer, vinegar, jam, jelly, marmalade, pickles, sauce, fermented food products.

Microbial Technology – microbial production of alcohol, glycerol, beer, lactic acid, sorbitol, citric acid, vitamins; amino acid fermentation, cocoa and coffee fermentation; production dextran; production, isolation and use of microbial enzymes, steroids, antibiotics, antifungal antibiotics; production of algal protein.

Unit operation – basic principles, preparative operations in food industry, emulsification, filtration, contact equilibrium, separation process, mechanical and membrane separation, centrifugation, extraction, crystallization, heat processing, heat transfer theory and its application, fluid flow theory and its application, vacuum systems, effect of extrusion parameter for products.

CO: Course content helps in the development of rationale of biotechnological basis of food processing. Procedures of food manipulation and its processing techniques prepare students for food industries.

Practical – II Food Analysis & Food Processing (Credit 2+2 = 4)

a. Food Analysis

1. Estimation of Moisture and ash content in food,
2. Estimation of a. Total carbohydrate, b. Total Protein content, c. Fat content
2. Acid value, Iodine value, Peroxide value unsaponifiable matter of fats and oils.
3. Determination of mineral content in food: Ca, P, Fe, Cu.
4. Determination of Vitamins content in Food: (i) Ascorbic acid, (ii) Vitamin A, (iii) Thiamine (iv) Tochoferol.
5. Determination of fibre in food
6. Estimation of Cholesterol and phospholipids of milk
7. Electrophoresis and Chromatography techniques for separation of biomolecules.

b. Food Processing

Vegetable and fruit juice, pulp, powder, bread, biscuits, cakes and milk based products, squash, jam, jelly, marmalade, nonalcoholic beverages, sauce, fermented vegetable and food products. Quality assessment of the processed food.

Preservation of fruits, vegetables etc. by canning, drying. Preservation of milk and milk based products.

CO: Course provides hands-on training of Food analysis and food processing.

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Semester III

Nutritional Science (Credit 4)

Basic nutrition: Nutritional needs in adulthood, Principles in nutrition, methods applied to nutrition in conducting nutritional research, application of epidemiology, current epidemiological problem. Interrelationship between nutrition and health- visible symptoms of good health.

Vitamins: Sources, dietary requirements, physiological function of fat and water soluble vitamins. Assay of vitamins, antivitamin, hypervitaminosis. Role of vitamins E and C as natural antioxidants.

Macrominerals : Na, K, Ca, Mg, Cl, P – sources, requirements and nutritional importance, macrominerals and hypertension.

Microminerals : Fe, Zn, Cu, Se, Cr, I, Mu, Mo, Ni, Si, Co etc. – sources, interaction with other nutrients, nutritional importance. Toxicity of microminerals.

BMR, SDA, RQ, ACU, physical activity and energy consumption. N-balance, estimation of protein quality. Deficiency of amino acids and their effects on the developing offspring,

Problems in Human Nutrition: Protein energy malnutrition, anaemia, vitamin A deficiency, rickets, osteomalacia, osteoporosis, beriberi, pellegra, scurvy, goitre, flurosis. Hypervitaminosis and excess intake of minerals.

Maternal & Child nutrition: aspects of normal human growth and development, maturation and adjustment made at birth.

Nutrition during lactation: Nutritional requirements during lactation and its impact on milk production. Impact of lactation on the physical, mental and emotional development of infants.

Role of nutrition on physical and mental development—prenatal and postnatal, Nutritional assessment of growth, during infancy, Rate of growth – weight as an indicator of good nutrition. Infant feeding – advantages of breast feeding, breast feeding vs. Artificial feeding, Nutritional disorders during infancy, Feeding of immature infants and diseases of children.

Growth and development of preschool children: Nutritional requirement during preschool age- meal pattern and their nutritional problems in India. Meal pattern and nutritional requirement of school going children—special feeding programmes of the school children.

Geriatric Nutrition: Nutritional support in old age, postmenopausal women.

Nutrition in Sports: Nutrition in relation to work, sports, exercise and other environmental, stresses. Adequate fluid and electrolyte replacement in maintaining exercise performance; carbohydrate loading for well-trained endurance athlete. Importance of glycogen loading in the athlete.

CO: Course content deals with the information of micro-nutrients and its importance in different stages of life i.e., from birth to growth and development as well as altered physiological conditions.

Therapeutic Nutrition (Credit 4)

Meaning of therapeutic nutrition and dietetics, purpose and principles of therapeutic diets, modification of normal diet into therapeutic diets.

Nutritional assessment in patient care, physical and psychological aspects of patient's feeding.

Routine Hospital Diets: basic concepts and methods of i) oral feeding. ii) tube feeding iii) parental nutrition iv) intravenous feeding v) pre and post operative diets vi) diets in surgical conditions and burns.

Incidence, etiology, pathology, metabolic changes, clinical manifestations, complications, dietary management, and counseling for the following disorders:

- A. Systemic disorder – 1. Diabetes, 2. Cardiovascular diseases
- B. Metabolic disorder - 3. Obesity & underweight, 4. gout, 5. osteoporosis
- C. Genetic disorders – 6. in born error of metabolism, 7. Mentally retarded patients
- D. Immune disorder – 8. arthritis
- E. Neurological disorder – 9. Alzheimer's diseases, 10. Autism
- F. Infectious diseases – 11. Tuberculosis, 12. leishmaniasis, 13. AIDS, 14. GI system disorder
- G. Renal disorder – 15. renal failure, 16. kidney stone
- H. Cancer.

CO: Course provides training in understanding of pathophysiological basis of diseases as well as clinical dietetics and nutrition.

Community Nutrition & Extension Education (Credit 4)

1. Meaning of community and community nutrition, nutritional status, demography, vital statistics, malnutrition
2. Measurement to combat malnutrition – Nutritional policy and programme. Planning and role of agencies of government and non government (private/ voluntary), international organisation.
3. Nutrition for national development and economic improvement.
4. Assessment of nutritional status of individual and community
5. Ecology of malnutrition – environmental, social and economic factors, food habits, food faddism, ignorance and food losses
6. Nutrition education – meaning and objectives suitable aids and methods for functioning nutrition education to different groups within the community.
7. Impact of agricultural production, storage and distribution of food
8. Food fortification and enrichment
9. Nutrition Surveillance
10. Meaning, scope, principle and objectives of extension. Elements involved in the extension education process, qualities of extension workers.
11. Classification of extension teaching methods. The advantages and limitations of different extension method.
12. Understanding the adult learners, motivation techniques to urge adults to learn.
13. Importance of programme planning, implementation and evaluation. Principles of programme planning.

CO: Course train students to understand nutritional problems in community and thereby develop educational training aid for nutritional awareness.

Food Microbiology & Food Toxicology (Credit 4)

Introduction to food microbiology - Characteristics of microorganism in food, microbial growth characteristics and its influencing factors in food, microbial metabolism of food components, microbial sporulation, Bacterial genetics.

Microbial food spoilage – mechanism and its indicators.

Health benefits of beneficial bacteria.

Microbial food borne diseases – identification of species, mechanism of infection, symptoms and treatments of gram negative (Salmonella, Campylobacter jejuni, Enterohemorrhagic E. coli, Yersinia, Shigella) and gram positive (Histeria, Clostridium botulinum, C. perfringens, Bacillus cereus) food borne diseases; Food borne toxicoinfection, Fungal and algal toxin.

Food toxicology – Biotransformation by Phase I and II Enzymes; carcinogens, prion, toxic phytochemical, Pesticide and industrial waste contaminated food toxicants during food processing; probiotic, prebiotic and synbiotic; In vivo balance between oxidants and antioxidants.

Suggested books:

- a) Fundamental Food Microbiology – Bibek Roy, CRC Press, ISBN 0-8493-0045-2.
- b) Food Microbiology: An Introduction – Thomas J. Montville & Karl R. Matthews, ASM Press, ISBN 978-1-55581-396-3.
- c) Introduction to Food Toxicology – Takayaki Shibamoto & Leonard F. Bjeldane, Academic Press, ISBN 978-0-12-374286-5.

CO: Basic microbial principles, microbes linked with food and microbes associated food toxicology – all these are important ingredient of maintaining food quality in food industry.

Practical – III Dietetics & Food Safety (credit 2+2 = 4)

a. Dietetics (including Meal Planning)

Diet and nutrition surveys

- Diet survey – vulnerable groups

Nutritional assessment of children (by clinical & anthropometric techniques)

Preparation of low cost nutritional recipe

Meal planning of different diseases (as in theory) & modification

Nutritive value Table – use & limitations

Food exchange list for dietary calculation and meal planning

Market survey in local areas

Visit to hospital/ public health centers/ any nutritional assessment programme/ Food production centre – for survey

A minimum of two case histories (of patients) should be done by each student.

b. Food Safety (including Food Microbiology & Food Toxicology & Food Adulteration)

Culture of microorganisms, Gram staining, Spore staining, Fungus staining. Detection of food spoilage organisms. Phosphatase test for proper pasteurization of milk. Coliform bacteria isolation from different water sources. MIC test for antibiotic. Microbiological assays (MBAs) of vitamins. Assay of riboflavin using lactobacillus.

Adulteration of food:(i) Metanil yellow in sweets, ice-cream and beverages. (ii) Aluminium foil in sweet. (iii) Margarin in Ghee (iv) Water in milk.(v) Chalk Powder in sugar. (vi) Khesari flower in Besan

CO: Course provides hands-on training of Food analysis, food processing and food safety.

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Semester IV

Food Service Management (Credit 4)

Growth and development of food service in Institution, Basic factors involved in food service. Knowledge of commodities, aims and object of cooking food, preparation of ingredients, various methods of cooking, use and advantage of different kind of fuel, methods of service.

Influencing factors in successful institutional menu-planning: consideration with regard to nutritional/metabolic disorder-medical aspect, food habit of consumers argilability of ingredients and facilities.

Food costing and cost variance: analysis and its dependable factors, standard recipes, food selection, purchasing storing, indenting , issueing and consumption control system

Personal management: Organization chart for different food service unit, the staffing pattern, criteria for selection of dietician and food handlers, welfare provision and on the house training scheme

Communication and delegation: as a factor governing efficiency in institution management. Role of hygiene, sanitation and safety factor involved in institutional food service including the importance of creating right attitude of mind of the workers towards these factors in operational units. Planning and layouts of food service units indifferent Institution with special emphasis on kitchen, dinning hall, store, ---- and other food movement complex. Equipments for kitchen, dinning room and sundry, food, sales and service points, type of equipment, criteria for their choice, efficiency in operation and care.

CO: Course provides training to managerial training to managerial aspect for food service management in industry and home.

Food Preservation Technology (Credit 4)

Application of heat; canning technique; high and low temperature storage; cryogenic freezing; ionization radiation; ultrafreezing technique; sterilization; pulse electric field system; peroxide, chlorine and ozone treatment, acid treatment, nitrite and ammonia treatment, enzyme treatment, chemical preservatives, chelating agents, additives, coloring and curing agents, antioxidants, preservation of different food products, antifungal and antibacterial and antitoxic preservation, biologically based preservation, bacteriocin.

Preservation technology – Pasteurization, homogenizer, evaporators, different types of freezers, cryogenic and vaccum freezer, blast freezer, plate freezer, various types of dryers, lyophilizers, extruder,

Food Safety – Industrial strategies for ensuring safe food.

CO: Understanding of physical and chemical principles of food storage is an important aspect of food preservation. Course also deals with precautionary measures at industrial level.

Nutragenomics & Systems Biology (Credit 4)

Nutrigenomics: Dietary fibre - Definition, fibre components – cellulose, hemicellulose, pectin substances, lignin, gums, mucilage and algal polysaccharides, response of upper and lower G.I. tracts to dietary fibres, recommended intake; implications in disease prevention.

Flavonoids - Chemistry, source and nutritional importance of flavonoids.

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

Systems Biology: Views of Systems Biology. Genomic analysis of protein nutrition, high and restricted protein diet, The influence of gene on diet and role of GI niche on metabolism, Nutraceuticals and their appraisal in terms of gene expression and metabolite formation. Understanding of evolutionary pattern of human food intake behavior and its importance in therapeutic nutrition. Dietary management to food allergies. Computational approaches to long term assessment. Cognition and its role in food intake behavior.

CO: Course provides training to the genomics aspects of nutrition and thereby systems level understanding. Thus it would be helpful for students to understand the recent trend of research w.r.t. food industry, biotech companies and academia.

Project (Credit 8)

A project work has to do and a report has to be submitted individually by every student. Every student has to present his/her work in a public seminar.

CO: Provides practical training on data collection and analysis. Objective of the course is to prepare students for research field.