### BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

**M.Sc. NUTRITION AND DIETETICS - Course Structure under CBCS**

Applicable to the candidates admitted from the academic year 2008-2009 onwards

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Course Title</th>
<th>Ins. Hrs / Week</th>
<th>Credit</th>
<th>Exam Hrs</th>
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<tbody>
<tr>
<td>I</td>
<td>Core Course – I (CC)</td>
<td>Applied Physiology</td>
<td>6</td>
<td>5</td>
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<td>Core Course – II (CC)</td>
<td>Biomolecules and Intermediary Metabolism</td>
<td>6</td>
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<td>Core Course – III (CC)</td>
<td>Techniques for Clinical Nutrition - Practical</td>
<td>6</td>
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<td>Core Course – IV (CC)</td>
<td>Nutrition through Development Milestones</td>
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<td>Core Course – V (CC)</td>
<td>Community Nutrition</td>
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<td>Core Course – VI (CC)</td>
<td>Advanced Food Science</td>
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<td>Advanced Dietetics - Theory</td>
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<td>Core Course – VIII (CC)</td>
<td>Advanced Dietetics Practical and Internship</td>
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<td>Food Biotechnology</td>
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<td></td>
<td>Elective – I</td>
<td>Advances in Food Microbiology</td>
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<td>Core Course – X (CC)</td>
<td>Research Methods and Applied Statistics</td>
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<td>Techniques for Food Analysis - Practical</td>
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<td>Elective - II</td>
<td>Computer Applications in Nutrition and Dietetics</td>
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<td>Food Product Development and Marketing</td>
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<td>Elective - V</td>
<td>Bakery and Confectionery</td>
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Note:

Core Courses include Theory, Practicals & Project

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<tr>
<td>No. of Courses</td>
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<td>Credit per Course</td>
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Total Credits        70

Elective Courses
(Major based / Non Major / Internship)

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<td>Credit per Course</td>
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Total Credits        20

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<tr>
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<td>Practicals</td>
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Project

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<tr>
<td>Dissertation</td>
<td>80 Marks [2 reviews – 20+20 = 40 marks Report Valuation = 40 marks]</td>
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<tr>
<td>Viva</td>
<td>20 Marks</td>
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Passing Minimum in a Subject

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<tr>
<td>CIA</td>
<td>40%</td>
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<td>UE</td>
<td>40%</td>
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</tbody>
</table>

\{ Aggregate 50% \}

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SEMESTER I
CORE COURSE – I (CC) - APPLIED PHYSIOLOGY

Objectives:

To enable the students

1. understand the structure and Physiology of various organs in the body
2. obtain a better understanding of the principles of Nutrition and Dietetics through the study of Physiology

UNIT I: IMMUNOLOGY

Definition and topics of immunity, lymphocytes in immunity, antigens, development of cellular immunity, development of humoral immunity, antibodies, immune deficiency diseases, autoimmune diseases, allergy and immunology, hyper sensitivity reactions.

UNIT II: BLOOD, HEART AND CIRCULATION

a) Blood: Composition, functions,
   RBC – Structure, functions, erythropoiesis, haemoglobin.
   WBC – Structure, functions, classification.

b) Blood platelets: Structure, functions, reticule endothelial system.
   Spleen – Structure and functions.
   Lymph – Lymphatic system.

c) Heart and Circulation: Heart - Anatomy and Physiology.

Blood vessels – Structure of artery, vein, capillaries, cardiac output, arterial blood pressure, clinical measurement of blood pressure, properties of cardiac muscle, origin and conduction of heart beat, cardiac cycle, regulation of heart action.

Related Experience

Estimation of haemoglobin, RBC and WBC count.
Determination of blood groups. Identification of different types of white blood cells.
Arterial blood pressure and pulse rate

UNIT III: RESPIRATORY, DIGESTIVE AND EXCRETORY SYSTEMS

a. Respiratory System: Structure of respiratory organs, mechanics of respiration, structure of lung, chemistry of respiration, artificial respiration, control of respiration.
b. **Digestive System:** General anatomy of digestive system. Digestion in the mouth, stomach and intestines. Movements of small intestine, role of Pancreas. Liver – structure and function.

c. **Excretory System:** Physiology of kidney-nephron, formation of urine, voiding of urine.

Skin – structure and functions, regulation of body temperature.

**UNIT IV : ENDOCRINE AND REPRODUCTIVE SYSTEMS**

a. **Endocrinology:** Structure and functions of thyroid, pituitary, parathyroid, adrenals, islets of langerhans of pancreas, sex glands.

b. **Reproductive System:** General anatomy – Female and male reproductive system. Testis – Spermatogenesis, male sex hormones, ovaries, female sex hormones and menstrual cycle.

**UNIT V: NERVOUS SYSTEM AND SPECIAL SENSES**

a. **Nervous System:** Spinal cord: Structure and functions. Ascending and descending tracts, reflex action.

**Brain** – Structure and functions of cerebrum, optic thalamus, mid brain, pons, medulla oblongata, hypothalamus, cerebellum.

**Autonomic Nervous System:** Sympathetic and parasympathetic.

b. **Special senses: Physiology of vision:** structure of eye, dark and light adaptation, accommodation of the eye, visual fields, common defects due to abnormalities – presbyopia, cataract, astigmatism, blindness.

**Ear** – Structure and physiology of hearing.

**Reference Books**


**Journals**

1. The Journal of Laboratory and Clinical Medicine, C.V. Mosby Company.
CORE COURSE – II (CC)

BIOMOLECULES AND INTERMEDIARY METABOLISM

Objectives: To enable the students obtain in depth knowledge in the study of Biochemistry of major nutrients and metabolic pathway.

UNIT I: CARBOHYDRATES


UNIT II: METABOLISM OF CARBOHYDRATES

Glycolysis, TCA cycle, HMP shunt, energy production in the above pathways – oxidative phosphorylation and electron transport chain, gluconeogenesis, uronic acid pathway.

UNIT III: AMINO ACIDS AND PROTEINS


UNIT IV: LIPIDS


Metabolism of lipids – oxidation of fatty acids, biosynthesis of fatty acids (palmitic acid), biosynthesis of triglycerol, phospholipids, cholesterol and bile salts, fatty liver.

UNIT V: ENERGY

Unit of energy, determination of energy content of food Basal Metabolic Rate, determination of BMR, determination of total energy requirements, SDA of food, factors affecting total energy requirements. Carbohydrate, protein and fat as sources of energy.

References Books:
7. Swaminathan, M., Biochemistry for Medical students.

CORE COURSE – III (CC)
TECHNIQUES FOR CLINICAL NUTRITION (Practical)

Objectives: To enable the students

1. get practical experience in the Laboratory
2. develop skills to undertake research work

1. Analysis of Blood for
   a. Glucose
   b. Haemoglobin – 1. Cyanmeth Haemoglobin Method
      2. Wong’s Method
   c. Cholesterol
   d. Serum A/G ratio and total protein
   e. Serum phospholipid
   f. Serum vitamin A
   g. Serum Alkaline phosphatase
   h. Serum Glutamic oxaloacetate Transaminase
   i. Serum Glutamic pyruvate Transaminase
   j. Serum Bilirubin

2. Analysis of urine
   a. Creatinine
   b. Urea
   c. Total nitrogen
   d. Calcium
   e. Phosphorus
   f. Vitamin – C
References:

Books


CORE COURSE – IV (CC)

NUTRITION THROUGH DEVELOPMENTAL MILESTONES

Objectives:

To enable the students

1. understand the role of nutrition in different stages of life cycle
2. gain knowledge about the methods of assessment of nutritional problems and their implications

UNIT I : FOOD GROUPS AND RECOMMENDED ALLOWANCES

Different food groups, recommended allowances for Indians. Basis for requirements. Balanced menu.

Nutritional requirements for special events

Nutritional requirements and food modification in higher altitudes, space travel and sea voyage. Sports nutrition.

UNIT II : NUTRITION IN PREGNANCY AND LACTATION


Related Experience
Planning diets to meet the requirements at different economic levels – low, middle and high income for the following conditions.

1. Pregnancy
2. Lactation

UNIT III: NUTRITION IN INFANCY


NUTRITION FOR PRESCHOOL CHILDREN

Growth and development of preschool children. Food habits and nutrient intake of preschool children, dietary allowances, supplementary foods, effect of food on brain and brain development in preschool age.

Related Experience

Planning diet to meet the requirements at different economic levels – low, middle and high income for preschool age.

UNIT IV: NUTRITION DURING SCHOOL AGE

Physical Development, school lunch programmes. Food habits and nutritional requirements, behavioural characteristics. Attention span and exploratory behaviour.

Related Experience

Planning diet to meet the requirements at different economic levels – low, middle and high income for school age.

NUTRITION DURING ADOLESCENCE

Changes of growth, characteristics of adolescents. Nutritional needs of the adolescents.

Related Experience

Planning diet to meet the requirements at different economic levels – low, middle and high income for adolescents.

UNIT V: NUTRITION FOR THE ADULTS

Basis for requirement. Nutritional requirements, nutrition and work efficiency.

Related Experience

Planning diet to meet the requirements at different economic levels – low, middle and high income for adult

NUTRITION FOR THE AGED
Socio-economic and psychological factors. Nutritional requirements, advances in geriatric nutrition.

Related Experience

Planning diet to meet the requirements at different economic levels – low, middle and high income for old people

References:

Books

Journals
1. Indian Journal of Nutrition and Dietetics, Avinashilingam Deemed University, Coimbatore.
2. Indian Journal of Medical Research, New Delhi.

CORE COURSE – V - COMMUNITY NUTRITION

Objectives: To enable the students

1. gain insight into the national nutritional problems and their implications
2. develop skills in organizing and evaluating nutrition projects in the community

UNIT I : NUTRITION AND NATIONAL DEVELOPMENT, ECOLOGY OF MALNUTRITION

Introduction of nutrition to national development in terms of socio-economic, industrial and agricultural development.

Consequences of malnutrition, reduced physical work capacity and mental efficiency, cost of wastage due to malnutrition in pregnancy, childhood etc.
IMR, NMR, MMR, prevalence of common nutritional problems – PEM, Vitamin – A deficiency, diseases, anaemia, iodine deficiency disorders and fluorosis.

Ecological factors leading to malnutrition such as income, size of families, dietary pattern, occupation, customs, food fads, fallacies, ignorance and other factors. Synergism between malnutrition and infection.

UNIT II : STRATEGIES TO OVERCOME MALNUTRITION

Measures to overcome malnutrition, increased agricultural production, animal husbandry with emphasis on nutritious foods and nutrition gardens, food technology, food fortification and enrichment, nutrition education. Nutrition Intervention programmes.


Assessment of nutritional status. Dietary survey, anthropometry, clinical examination, laboratory examination.

Related Experience
A community nutrition camp for 15 days in a village.

UNIT III : NATIONAL AND INTERNATIONAL VOLUNTARY ORGANISATIONS TO COMBAT MALNUTRITION

ICMR, CHEB, CSWB, SSWB, NIN, NNMB, CFTRI, DFRI, NIPCCD. International organizations – FAO, WHO, UNICEF, WORLD BANK, FFHB, IBP. Voluntary Services – AIWC, BGMS, KGNMT, CARE, CWS, CRS, AFPRO, HSAI.

UNIT IV : NUTRITION EDUCATION

Meaning, nature and importance of nutrition education to the Community. Training workers in nutrition education. Programmes for integration of nutrition education.

Related Experience
Community related experience in planning, conducting and evaluating nutrition education programmes in a selected community.

UNIT V : ORGANISATIONS OF NUTRITION EDUCATION PROGRAMMES

Principles of planning, executing and evaluating nutrition education programme, problems of nutrition education programme.
Reference Books

2. Bell, G.H., Davidson, J.N. and Scarborough, H. The Text book of Physiology and Biochemistry

Journals:

2. The Journal of Laboratory and Clinical Medicine, C.,V. Musby Company
Objectives: To enable the students

1. gain knowledge on source and properties of food
2. develop skills to judge the quality of cooked foods

UNIT I: PHYSIOLOGICAL CHANGES

Physical properties of water and ice, absorption phenomena, solutions and colloidal properties, freezing and ice structure.
Colloidal salts, stabilization of colloidal systems, properties of colloids.


SUGAR COOKERY AND SWEETENERS

Sugar cookery, sources, uses, properties, syrups, sugar artificial sweeteners, chemistry related to usage in food products. Structural relationship to sweetness, perception hydrolytic reaction, solubility and crystallization, Textural contribution, fermentation. Amorphous and crystalline candies, fondant, caramel, brittles and fudge.

Related Experience

Sugar cookery stages, preparation of fondant, fudge, caramel, pulled toffee and brittles. Preparation of gulab jamun, coconut burfi, brittle.

UNIT II: STARCH COOKERY

Sources, uses and chemical characteristics, factors affecting viscosity of starch pastes. Batters, doughs - types, properties, flour and flour quality, extruded foods, breakfast cereals, wheat, bulgar, puffed and flaked cereals, fermented foods – (cereal based products).

Related Experience

Starch – Microscopic examination, gelatinisation of starch, preparation of idli, dosai, appam, chappathi, paratha, poori.

LEGUMES

Pulses – Grams, dhal, nuts, processing, composition, methods of cooking. Effect of processing such as cooking, decortication germination and fermentation.
Related Experience
Pulse – effect of soaking (time and types of water), germination.

UNIT III: FATS AND OILS
Sources, composition of fats and oils. Chemical changes in fat during storage and cookery. Fat substitutes and fat deterioration. Antioxidants, hydrolysis, interesterification of fats.

Related Experience
Smoking temperature, factors affecting absorption of fat.
Deep fat fried foods, preparation of pastries.

MILK AND MILK PRODUCTS
Milk and milk products, composition and nutritive value, physical and chemical properties.
Milk protein, coagulation, factors affecting coagulation, problems in milk cookery.
Cream types, uses of butter, cheese types and making cheese.
Cultured milk, yoghurt, whey, concentrated dried products, whey substitutes.

Related Experience
Principles involved in the preparation of tomato soup. Cooking vegetables in milk, cheese, setting of curds.

UNIT IV: FLESHY FOODS
Meat structure and composition, cuts of meat, postmortem changes, methods of cooking, tenderizers, factors affecting tenderness.

Fish - Classification and kinds, nutritive value, selection and methods of cooking.
Poultry - nutritive value, selection and methods of cooking.

Related Experience
Meat, fish, poultry changes in cookery on tenderness, different methods of cooking.

EGG COOKERY
Structure and composition, selection and testing for freshness of eggs.
Coagulation of egg protein, factors affecting.
Egg processing, egg cooked in shell, poached egg, custard, omelettes, angel cake, sponge cake, low cholesterol egg, double yolk eggs.
Related Experience

Coagulation of egg white and egg yolk, boiled egg, poached egg, custard cake, emulsion, mayonnaise. Egg quality testing.

UNIT V: PLANT PIGMENTS

Fruits and vegetables, structure, texture, pigments in vegetables and fruits, effect of acid, alkali etc, on pigment. Cellulose and pectic substances, browning reaction in fruits and vegetables and preventive methods. Different methods of cooking and the effect on structure and pigment of volatile substances.

Related Experience

Effect of acid and alkali. Effect of heat on pigments in fruits and vegetables.

ACCEPTABILITY TESTING

Evaluation of foods by subjective and objective methods, factors affecting the acceptability of foods. Selection of taste panel.

Difference, preference and descriptive tests, microscopic examinations. Physical and chemical methods, physical characteristics - colour, appearance, texture, density, tenderness. Viscosity and surface tension, moisture content, loss of weight.

Related Experience

Evaluating the quality acceptability of foods, subjective and objective methods.

POST HARVEST TECHNOLOGY

Post harvest losses, reasons for losses, techniques to overcome losses.

Reference Books


Journals

2. Nutrition and Food Science and Technology, Association of Food Technologists.
Objectives:

To enable the students
1. understand the role of dietitian
2. gain knowledge about the principles of diet therapy and different therapeutic diets
3. develop aptitude for taking up dietetics as a profession

UNIT I: ROLE OF DIETETIAN IN THE HOSPITAL AND COMMUNITY

Education and personal qualifications, Professional ethics and obligations.

FEEDING THE PATIENTS

Psychology of feeding the patient, assessment of patients’ needs.

ROUTINE HOSPITAL DIETS

Regular diet, solid diet, full liquid diet, clear diet and tube feeding, diets for surgical conditions and allergic conditions.

UNIT II: MODIFICATIONS OF DIETS, DIET COUNSELING AND DIET PLANNING FOR FOLLOWING CONDITIONS

Acute, chronic and recurrent fevers, typhoid, rheumatic fever, poliomyelitis, cholera, tuberculosis and malaria

GASTRO-INTESTINAL DISORDERS

Etiology and modifications of diet in peptic ulcer, gastritis, diarrhoea, constipation, malabsorption syndrome, ulcerative colitis, enteritis and carcinoma.

LIVER, GALL BLADDER AND PANCREATIC DISORDERS

Etiological factors, dietary regimen in jaundice, cirrhosis, hepatitis, hepatic coma, cholecystitis, cholelithiasis and pancreatitis.

UNIT III: METABOLIC DISORDERS

Predisposing factors and modification of diet in diabetes mellitus, obesity, underweight. Hypothyroidism, hyperthyroidism, gout.

UNIT IV: CARDIOVASCULAR DISORDERS
Risk factors and dietary regimen – Acute and chronic cardiac disease, vascular disease
atherosclerosis, hypercholesterol, hyperlipo-proteinemia, essential hypertension.

UNIT V: RENAL DISORDERS

Contributory factors and dietary modification, acute and chronic glomerulonephritis,
nephrosis, nephrosclerosis, uremia, nephrolithiasis.

References:

Books


Journals

Secretary of Indian Dietetic Association 27/1 Manoharpuku, Calcutta – 700 029.
3. Clinical Nutrition, Sales Promotion, Department , Churchill Livingstone Medical Journals
Robers Stevenson House, 1-3, Baxter’s place, Edinburgh EHI, EAF. Uk.
6. Indian Journal of Medical Research.

CORE COURSE – VIII (CC)
ADVANCED DIETETICS PRACTICALS AND INTERNSHIP

Objectives: To enable the students

1. develop skills in planning and therapeutic diets
2. develop skills in diet counseling and feeding of patients
3. develop capacity for taking up dietetics as a profession

PRACTICAL AND RELATED EXPERIENCES
1. Practical experience in weighing and measuring food items.
2. Preparation of clear and full liquid diets and soft diet
3. Planning and preparing diets for:
   a. Febrile conditions
   b. Surgical conditions
   c. Gastro-intestinal disorders
   d. Liver and gall bladder disorders
   e. Metabolic disorders
   f. Cardiovascular disorders

17
g. Renal disorders  
h. Obesity and underweight  
i. Nutritional deficiency

4. Planning and preparing paediatric diets

   a. Lactose free diet  
   b. Juvenile diabetes  
   c. diet for inborn errors of metabolism

5. Visit to three hospitals

   The practical work consists of internship in a teaching hospital for four weeks.

   1. Visits to different wards to observe patients requiring special diets.  
   2. Experience in calculating and planning modified diets.  
   3. Supervising and handling the food preparation and service in the dietary department of the hospital.  
   4. Case study  
      Selecting and observing patients requiring therapeutic diet in relation to Patient’s dietary history – income, occupation, food habits and social factors.  
      Calculating the diet according to medical prescription.  
      Accompanying the doctor while visiting the patient.  
      Counselling and patient education.

CORE COURSE – IX (CC)  
FOOD BIO TECHNOLOGY  

Objectives: To enable the Students

1. understand the application of biotechnology in the field of Nutrition and Dietetics  
2. create interest in related activities

UNIT I : GENETIC ENGINEERING


FERMENTATION SYSTEMS AND ENZYME TECHNOLOGY

Fermentation Systems – Batch and continuous process, fermenter design, bioprocess control. Soluble enzymes, immobilized enzymes, analyses, invertase, glucose isomerase – Synthesis, process and applications in food industries.
UNIT II: TISSUE CULTURE

Plant and animal tissue culture – principles and procedure, culture media, applications. New breeding lines and plant varieties, transgenic plants, terminator seed technology, artificial seeds.

SINGLE CELL PROTEIN AND MYCOPROTEIN

Production of microbial protein, SCP, substrates, nutritional value, harvesting – spirulina, mushroom culture and yeast biomass production.

Related Experience

Visit to a plant tissue culture laboratory.

UNIT III: REGULATORY ASPECTS OF BIOTECHNOLOGICAL METHODS

Downstream processing, biosensors, biochips, limiting factors and regulation. Impact of biotechnology on the nutritional quality of foods.

UNIT IV: XENOBIOTICS

Definition, components, drug adverse reactions, nutrient drug interaction, industrial chemicals. Bio-dynamics of xenobiotics, overall metabolic fate of xenobiotics in the body.

NATURALLY OCCURRING FOOD TOXICANTS AND THEIR ELIMINATIONS

Sources, toxicity, elimination – protease inhibitors, goitrogens, haemagglutinins, glucosinolates, cyanogens, saponins, gossypols, lathyrogens, favism and carcinogens.

UNIT V: ROLE OF BIOTECHNOLOGY IN FOOD INDUSTRIES

a) Food additives, synthesis, acidulants – citric acid, gluconic acid, lactic acid. Sweeteners – glucose syrup and High Fructose Corn Syrup (HFCS), thickeners and gelling agents, xanthangums.

b) Vitamins – Vitamin A, ergosterol, riboflavin, Vitamin-B12, fatty acid, amino acids – lysine, methionine, glutamate.

c) Food fermentations – Alcoholic beverages, cheese making, fermented soya based foods, meat fermentation, vinegar, safety aspects of foods produced by biotechnology and genetic engineering.

References Books


SEMESTER III - CORE COURSE – X (CC) –

RESEARCH METHODS AND APPLIED STATISTICS

Objectives: To enable the Students

1. understand the fundamental principles and techniques of methodology concerning research
2. apply statistical procedure to analyse numerical data and draw inference

UNIT I : TYPES OF RESEARCH

Different types of research and their applications.

METHODS OF COLLECTING DATA

Conducting enquiries to collect primary data. Source for secondary data, preparation of schedules and questionnaires, Processing data, interview method of enquiry, training of interviewers. Editing and coding the data.

UNIT II : CLASSIFICATION AND ORGANISATION OF DATA

Classification by the categories and measurements, discrete and continuous variables. Tabulation scheme, preparation of tabular forms, methods of securing accuracy in tabulation.

REPRESENTATION OF THE DATA

Graphical and diagrammatic representations. Use of computers in data processing and presentation.

UNIT III : SAMPLE SURVEYS

Choice of the sample, random samples, systematic samples, Cluster samples / multistage sample and quota sample. Sources of bias and methods of reducing bias.
EXPERIMENTATION AND THESIS WRITING

Principles, Planning of experiments. Presentation of data, writing reports, footnotes and bibliographical citations.

UNIT IV : MEASURES OF CENTRAL TENDENCY

Mean, median, mode, their relative advantages and disadvantages, Measures of dispersion, mean deviation, coefficient of variation, percentiles and percentile ranks.

CORRELATION

Association of attributes, contingency table, correlation, coefficient of correlation and its interpretation, rank correlation, regression equations and predictions.

UNIT V : PROBABILITY

Rules of probability and its applications.

DISTRIBUTION

Normal, binomial, their properties. Importance of these distributions in statistical studies. Large and small samples, X and F tests, tests for independence using contingency, Analysis of Variance and applications.

References:
Books


CORE COURSE –XI -TECHNIQUES FOR FOOD ANALYSIS - PRACTICAL

Objectives: To enable the students

get practical experience in the laboratory and develop the skills to undertake research work
Experiments in Nutrition: (Individual Experiments)

1. Analysis of food for
   a) Energy
   b) Fibre – crude and dietary
   c) Moisture
   d) Nitrogen by Kjeldhal Method
   e) Ash
   f) Calcium
   g) Phosphorus
   h) Iron
   i) Carotene
   j) Vitamin – A
   k) Thiamine
   l) Riboflavin
   m) Vitamin – C
   n) Fat

2. Glycogen – Extraction and estimation
3. Fats, saponification value
4. Iodine number
5. Acid number and RM value
6. Extraction of lipids from egg yolk.

References:
Books
   Fifth reprint, New Delhi.
   Itinmaon Medical Books, London.

CORE COURSE – XII (CC) – MACRONUTRIENTS

Objectives: To enable the students

1. obtain indepth knowledge on major nutrients
2. develop competentey for undertaking nutritional investigations
UNIT I: DEVELOPMENT OF NUTRITION AS A SCIENCE IN INDIA AND ABROAD


UNIT II: FATS AND LIPIDS


Role of fat in the etiology of atherosclerosis.

UNIT III: ENERGY

Historical background, energy content of foods, energy measurements – direct and indirect calorimetry energy utilization in cells. Energy balance and control of body weight.

UNIT IV: PROTEINS AND AMINO ACIDS

Historical review, functions and sources of proteins. Protein turnover, synthesis and storage, protein as source of energy, review of digestion, absorption and utilization of proteins. Protein requirements – ICMR, FAO and WHO. Computation of protein requirements through factorial method and balance study.


UNIT V:

Water – Distribution and functions of water, water balance – maintenance and determination. Physiological variations in the intake and output of water.

Hormones, water retention and depletion requirements.

References:

Books
1. All monographs and Technical Reports of FAO and WHO.
7. World Review of Nutrition and Dietetics – All volumes.

Journals:
3. Indian Journal of Medical Research, Indian Council of Medical Research, New Delhi.
6. The Indian Journal of Nutrition and Dietetics, Sri Avinashilingam Education Trust Institutions for Women.

CORE COURSE – XIII (CC) - MICRONUTRIENTS

Objectives: To enable the students
1. obtain indepth knowledge on the study of major nutrients
2. develop competence for undertaking investigations

UNIT I: CALCIUM AND PHOSPHORUS

Distribution in the body, calcium phosphorus ratio, absorption and utilization, phosphates in blood, Therapeutic uses and toxicity of phosphates. Calcium absorption and utilization, calcium balance, requirement and sources. Hypocalcemia and hypercalcemia.

MAGNESIUM, SULPHUR, SODIUM AND POTASSIUM

Distribution, absorption and utilization, sources, requirement, deficiency and toxicity. Sodium potassium balance.

UNIT II: IRON, IODINE AND FLUORINE

Distribution, absorption, transport and utilization, functions, sources, requirements and deficiency. Assessment of nutritional status and toxicity. Methods of assessing iron availability, effect of excess iron retention and deficiency.

ZINC AND OTHER TRACE ELEMENTS

Metabolism, functions, sources, deficiency, toxicity, requirements.
UNIT III : VITAMINS

Number and naming of vitamins, units and measurements of vitamins. Factors influencing the utilization of vitamins.


UNIT IV: WATER SOLUBLE VITAMINS


UNIT V : INTERRELATIONSHIP OF NUTRIENTS

Interrelationship between nutrients and hormones in general, interrelationship between calcium, phosphorus, vitamin D and Parathyroid, interrelationship between the vitamins, between the minerals and between vitamins and minerals.

References:

Books

1. All monographs and Technical Reports of FAO and WHO.
12. World Review of Nutrition and Dietetics – all volumes.

Journals

4. Indian Journal of Medical Research, Indian Council of Medical Research, New Delhi.
8. The Indian Journal of Nutrition and Dietetics, Sri Avinashilingam Education Trust Institutions for Women, Coimbatore.
11. New England Journal of Medicine, Massachusetts Medical Society, USA.
13. Journal of Biochemistry, American Society of Biological Chemistry, USA.

ELECTIVE – I (EC) - ADVANCES IN FOOD MICROBIOLOGY

Objectives:

To enable the students

1. gain deeper knowledge on micro-organisms in humans and environment
2. understand the importance of micro-organisms in food spoilage and learn advanced techniques used in food preservation
3. understand the latest procedures adopted in various food operations to prevent food – borne disorders and legal aspects involved in these areas

UNIT I : INTRODUCTION AND MICRO ORGANISMS OF IMPORTANCE IN FOOD

Introduction to historical developments in food preservation, spoilage, infections and legislation. Their primary sources in foods, morphology, cultural characteristics and biochemical activities.

UNIT II : FACTORS AFFECTING THE GROWTH OF MICRO-ORGANISMS IN FOOD

Intrinsic and extrinsic parameters that affect microbial growth.
Related Experience

Study of environment around us as sources of transmission of micro-organisms in foods.

METHODS OF ISOLATION AND DETECTION OF MICRO-ORGANISMS OR THEIR PRODUCTS IN FOOD

Methods:

Conventional Methods:

Rapid Methods (Newer techniques)

Immunological Methods: Fluorescent, antibody, radioimmunoassay, ELISA etc.

Chemical Methods: Thermos table nuclear, ATP measurement and PCR (Polymers chain reactions) only principles in brief.

Related Experience

Assessment of surface sanitation of food preparation units ‘swab and rinse’ techniques.
Isolation of micro-organisms, different methods and maintenance of cultures of micro-organisms.

UNIT III : SPOILAGE OF DIFFERENT GROUPS OF FOODS AND FOOD PRESERVATION

Spoilage: Cereal and cereal products, vegetables and fruits, meat and meat products, eggs and poultry, fish and other sea foods, milk and milk products and canned food.

Preservation: Physical methods – Drying, freeze drying, cold storage, heat treatments, irradiation and high pressure processing.

Related Experience

Bacteriological analysis of foods both processed and non processed like vegetables, fruits, cereals, spices and canned foods using conventional methods, yeast and mold count in foods.

UNIT IV : FOOD BORNE DISEASES, INDICATORS OF FOOD SAFETY AND QUALITY

Bacterial and viral food-borne diseases. Important food-borne animal parasites and mycotoxins.
Microbiological criteria of foods and their significance.
HACCP system and food safety used in controlling microbiological hazards.

**Related Experience**

Biochemical tests used in identification of commonly found bacteria in foods. IMVIC ureases, H2S, catalase coagulation and fermentation.

**UNIT V: ROLE OF MICROBES IN FERMENTED FOODS**

Role of microbes in fermented foods and genetically modified foods.

**Related Experience**

Visit to food processing unit dealing with advanced methods in food microbiology.

**References:**

**Books**


**Journal**

1. Journal of Food Science Published by the Institute of Food Technologies, Chicago, U.S.A.
2. Journal of Food Science and Technology published by the Association of Food Scientists and Technologists, CFTRI, Mysore.
ELECTIVE – II (EC)
COMPUTER APPLICATION IN NUTRITION AND DIETETICS

Objectives: To enable the students

1. understand the concept of working knowledge of Computer
2. develop ability in working of projects

UNIT I : INTRODUCTION OF COMPUTERS IN BIOLOGICAL SCIENCES

History and development of computers. main frame, mini, macros and super computer systems, BITS, BYTES. General awareness of computer hardware – CPU input and output devices, main and auxiliary stage devices.

UNIT II : OPERATING SYSTEMS


MS-OFFICE PROGRAMMING

Visual basic, application to projects, data types and control structures.

UNIT III : COMPUTER NETWORKS

Computer network – LAN, WAN, Intranet, extranet, Internet and Internet service providers. Modern Fibre Optics. Basics of HTML, WWW, URL, TCP / IP.

UNIT IV : MULTIMEDIA

Basic elements, hardware, application of multimedia. Introduction to Multimedia authorizing tool.

UNIT V : PROGRAMMING


Related Experience

Basic knowledge and working mechanism of Computers.

References:
Books
7. Russel, Cheris, 2000. Internet and E-mail in easy steps, Dreamtech Press, New Delhi.

ELECTIVE – III (EC) - FOOD PACKAGING

Objectives: to enable the students

1. gain knowledge about various packaging materials and importance of packaging
2. be familiar with testing and evaluation of packing media
3. be familiar with packaging laws and regulations
4. be able to select appropriate packaging material for a variety of food stuffs vis-à-vis the need for preventing environment degradation

UNIT I : PACKAGING

Concepts, definition, significance, classification. Development, unit/Retail. Fresh and processed, general characteristics and food preservation.

UNIT II : PRIMARY PACKAGING MEDIA

Properties and applications.

a. Paper boards, metals, plastics, wood and plywood, glass, flexible, etc.
b. Labels, caps and closures, waxes, adhesives, inks and lacquers, cushioning materials.

UNIT III : FOOD PRODUCTS

General classification and packaging types.

PACKAGING SYSTEMS AND METHODS

Vacuum packaging, gas flush Packaging, CAP and MAP, aseptic and retort packing bag-in-boxete.

Related Experience
Visit to a Packing Industry.
UNIT IV : STORAGE, HANDLING AND DISTRIBUTION OF PACKAGES (FOODS)

Palletisation and containerization. Marketing - barcoding and marketing.

UNIT V : PACKAGING LAWS AND REGULATIONS

FDA, FPO, packaging commodity. Rules, Weight and Measures Act.

Reference Books

3. Hotchikess, Food and Packaging Interaction- American Chemical Society.

ELECTIVE IV (EC)

FOOD PRODUCT DEVELOPMENT AND MARKETING

Objectives: To enable the students

1. develop products which meet consumer needs nutritionally and commercially viable
2. recognize the potential for entrepreneurship through marketing

UNIT I : NEW FOOD PRODUCTS


Reasons for new product development (corporate, market, technological, governmental influences).

Related Experience

Market survey

UNIT II : INTRODUCTION TO PHASES IN FOOD PRODUCT DEVELOPMENT

Idea generation, screening, development, production, consumer trials and test market.
Related Experience

Consumer survey to identify new products.

UNIT III : SCREENING

Team approach and involvement of various departments. Objectives, criteria of screening.

Related Experience

Screening the products. Developing criteria for screening and scaling up.

UNIT IV : TEST MARKETING, SCREENING PROCEDURE FOR PRODUCT

Evaluating result and analysing.
Sensory evaluation. Shelf-life, testing product, integrity and conformance to Standards.

Related Experience

Market Research
Test marketing.

UNIT V : ENTREPRENEURSHIP OF NEW PRODUCTS IN FOOD SERVICE INDUSTRY

Plant location, investments, financing the project.
New products in market, food service industry of Food Ingredient Industry.

Related Experience

Project Report

References:
Books
**Journals:**

1. International Journal of Food Science and Technology
2. Food Technology
3. Journal of Food Technology
4. Trends in Food Science and Technology
5. Clinical Reviews in Food Science and Nutrition

**ELECTIVE V (EC) - BAKERY AND CONFECTIONARY**

**Objectives:** To enable the students

1. learn the baking process
2. apply the knowledge in practical baking

**UNIT – I: INTRODUCTION OF BAKERY**

(a) Definition, principle and classification of baked products.
(b) Major / minor equipments required to start a small bakery Unit.

**UNIT – II: ROLE OF MAJOR AND MINOR INGREDIENTS IN BAKING**

(a) Role of flour (gluten), fat and egg in baking
(b) Leavening agents – definition, types (physical, biological and chemical) and role in baking.
(c) Sugar-Sources. Types and role in baking.
(d) Role of minor ingredients – Milk, water, salt, fruit and nuts.

**UNIT – III: PREPARATION OF BAKERY ITEMS**

a) Bread: Types, methods, faults, bread diseases and improvers.
b) Cake : Ingredients, types, methods and faults.
c) Biscuits and cookies – Ingredients, types, methods.

**UNIT – IV: ICING – CAKE DECORATIONS**

Introduction, types of icing – basic and royal

**UNIT – V : TYPES**

a) Oven at different temperatures (medium, hot, very hot). Types of Oven.
b) Quality Control.

**PRACTICAL**

1. Visit to a well established bakery unit
2. Bread Making
3. Preparation of Cakes and Sponge
4. Short Crust Pastry and Jam tarts
5. Muffins, Puff, Pastry
Related Experience:
Model assignment on Profile on Bakery Entrepreneurship.

Reference:

Books
2. Carole elements, Beautiful Baking, Richard blady publishing.
5. Kritika A. Mathew, Perfect Baking at Home, Bangalore.