

Annexure I-A
Eligibility

<p>M.Sc. Degree Course in Food, Nutrition & Dietetics</p>	<p>I.1. B.Sc. Home Science 2. B.Sc with Home Science/Nutrition as one of the subjects under restructured course 3. B.Sc. Vocational- Clinical Nutrition And Dietetics/ Food Sc. & Quality Control. 4. B.Sc Nutrition</p> <p>II. 50% of the seats be allotted to B.Sc. graduates with any Life Sciences subjects.</p> <p>The B.Sc. Home Science students be allowed to AUCET examination from Home Science scheme Test and B.Sc. Graduates with any life science subject which is the same as that of for Biotechnology AUCET Examination. The rank from the Biotechnology AUCET examination has to be considered for admission in to M.Sc. Food, Nutrtrion & Dietetics.</p>
---	---

ANEXURE-I B
M.Sc. FOOD, NUTRITION AND DIETETICS
(Credit based Semester System)
(Effective from the academic year 2016-17)
Scheme of Instruction and Examination

Paper No	Title of the paper	Periods/ week	Duration of Exam	Max.Marks	Credits
I Semester					
<u>Theory</u>					
FND 1.1	Food Chemistry	4	3	100	4
FND 1.2	Food Science	4	3	100	4
FND 1.3	Human Physiology	4	3	100	4
FND 1.4	Advanced Nutrition I	4	3	100	4
<u>Practical</u>					
FND 1.5	Food Chemistry	4	3	50	2
FND 1.6	Food Science	4	3	50	2
FND 1.7	Computer Applications	4	3	50	2
Total Marks and credits for I Semester				550	22
II Semester					
<u>Theory</u>					
FND 2.1	Food Processing & Preservation Technology	4	3	100	4
FND 2.2	Food Analysis & Instrumentation	4	3	100	4
FND 2.3	Nutritional Biochemistry	4	3	100	4
FND 2.4	Advanced Nutrition II	4	3	100	4
<u>Practical</u>					
FND 2.5	Food Processing & Preservation Technology	4	3	50	2
FND 2.6	Food Analysis & Instrumentation	4	3	50	2
FND 2.7	Nutritional Biochemistry	4	3	50	2
FND 2.8	Advanced Nutrition II	4	3	50	2
Total Marks and credits for II Semester				600	24
III Semester					
<u>Theory</u>					
FND 3.1	Food Microbiology & Toxicology	4	3	100	4
FND 3.2	Clinical and Therapeutic Nutrition	4	3	100	4
FND 3.3	Institutional Food Administration	4	3	100	4
FND 3.4	Research Methodology & Statistics	4	3	100	4
<u>Practical</u>					
FND 3.5	Food Microbiology & Toxicology	4	3	50	2
FND 3.6	Clinical and Therapeutic Nutrition	4	3	50	2
FND 3.7	Research Methodology & Statistics	4	3	50	2
FND 3.8	Dissertation & Seminar	4	3	50	2
Total Marks and credits for III Semester				600	24
IV Semester					
<u>Theory</u>					
FND 4.1	Nutrition in Critical Care & Diet Counselling	4	3	100	4
FND 4.2	Sports Nutrition	4	3	100	4
<u>Practical</u>					
FND 4.3	Nutrition in Critical Care & Diet Counselling	4	3	50	2
FND 4.4	Internship	4	3	50	2
FND 4.5	Project work & Dissertation	8	6	200	8
FND 4.6	Comprehensive Viva-voce	4	3	50	2
Total Marks and credits for IV Semester				550	22
Grand Total of Marks and Credits for 4 Semesters				2300	92

FND 1.1 FOOD CHEMISTRY

Objective

Understand the field of Food chemistry and its relevance to food industries & every day life

Course Content**UNIT I**

Introduction to Food Chemistry- Moisture in foods, Free & bound water, states of water, factors influencing boiling point and freezing point of water. Physics and Food-Solids, liquids and gases. Dispersions- True solutions, colloidal solutions & suspensions, Gels, emulsions and foams. Types of enzymes in foods, functions and use of enzymes in Food Industry.

UNIT II

Carbohydrate chemistry – Classification, chemical reactions of carbohydrates, structure, Types of starches, physical and chemical properties of starches, structure, Modified starches, Non starch polysaccharides- Cellulose, hemicellulose, pectin & Gums, types of gums and their uses in food industry, Commercial sugars & Non nutritive sweeteners
Vegetables and fruits: structural constituents of fruits and vegetables, changes during maturation, post harvest changes, pigments (chlorophyll, carotenoids, flavonoids), browning reactions, Flavour of Fruits and vegetables, Phytochemical constituents in food and its role in food industry.

UNIT III

Protein Chemistry - Chemical and physical properties of proteins, structure, denaturation & coagulation, theories of gel formation, collagen and gelatine, extraction of pure proteins from foods, Plant proteins, Meat and meat products- Animal muscle structure, connective tissue, adipose tissue, post mortem changes, colour of meat, tenderness and juiciness. Structure & properties of poultry, & fish meat, structure of egg, egg proteins & Milk Proteins

UNIT IV

Lipid chemistry- Fatty acids, structures, types of edible fats and oils, crystallinity of solid fats, physical and chemical properties of fats, flavour changes, rancidity, methods of evaluation of rancidity, reversion, shortening value of fats, Fat substitutes & Structured lipids

BOOKS AND JOURNALS

1. Meyers LH. (1969) Food Chemistry, Van Nostrand Reinhold Co.
2. Sri Lakshmi L (2004) Food Science. New Age Int.
3. Pecham GG, (1972) Foundation of food preparation. Mac millan Pbs.
4. Potter NH and Hotchkiss JH (1996) Food Science. 5th ed. New Delhi, CBS pbs.
5. Sethi M and Rao SE (2001) Food science experiments and application. CBS pbs. New Delhi.
6. Fennema's Food Chemistry, 4th edition, Srinivasan Damodaran, Kirk L Parkin, Owen R.Fennema
7. Dennis D.Miller (1998) Food Chemistry A Laboratory Manual,
8. Eram S.Rao (2013) Principles of Food science- A Practical Manual
9. Eram S.Rao (2013) Food Quality Evaluation
10. Journal of Food chemistry
11. Indian food Industry Journals- AFST Pbs
12. J of Food Sc. And Technology- AFST Pbs.

FND 1.2. FOOD SCIENCE

Objective

To enable the student understand the nutrient composition of foods and changes during cooking

Course Content**UNIT-I**

Introduction to Food Science- Food groups, food in relation to health, General Methods of cooking- dry and moist heat methods, microwave and solar cooking, advantages and disadvantages Nutrient losses during cooking. Sensory Evaluation of Foods- Physiological basis of sensory evaluation, sensory characteristics of food, selection of taste panel, types of tests used for sensory evaluation.

UNIT-II

Cereals & Millets- Types, Composition, nutritive value, Cereal cookery and changes during cooking, gelatinization, dextrinization, retrogradation and syneresis. Non enzymatic browning. Composition of commonly consumed cereal products. Breakfast cereals, Principles of baking, different types of flours for baking, Role of leavening agents in baking, method of preparation of breads, biscuits, cakes and pastry. Sugar cookery- stages of sugar cookery, amorphous and crystalline candies, Sugar related products

UNIT-III

Pulses- Types, Composition, nutritive value, Pulse cookery, Anti nutritional factors, types and composition of pulse based products

Milk & Milk products- Composition, coagulation, types of milk, Milk cookery, Changes during cooking, methods of preparation of milk products- cheese, butter, cream.

Flesh Foods: Meat & Poultry- Composition, nutritive value, cuts of meat, post-mortem changes, and methods of cooking, factors affecting tenderness. Fish: Composition, types of fishes, selection & cooking methods. Eggs: Composition, nutritive value, selection, storage, methods of cooking & changes during cooking

UNIT-IV

Fats and Oils- Types, energy value, Composition, sources, role of fats & oils in cookery, composition of unconventional oils.

Fruits and Vegetables- Types, composition, nutritive value, sources, effect of cooking on plant pigments and cooking methods of vegetables. Composition & Nutritive value of Beverages: Tea, Coffee, & Cocoa, Nuts and Oil seeds, Spices and condiments

BOOKS AND JOURNALS

1. Meyers LH. (1969) Food Chemistry, Van Nostrand Reinhold Co.
2. Sri Lakshmi L (2004) Food Science. New Age Int.
3. Pecham GG, Foundation of food preparation.1972. Mac millan Pbs.
4. Swaminathan M (1992) Handbook of Food Science and Experimental foods. 2nd ed. Bangalore.
5. Potter NH and Hotchkiss JH (1996) Food Science. 5th ed.. New Delhi, CBS pbs.
6. Sethi M and Rao SE (2001) Food science experiments and application. CBS pbs. New Delhi.
7. Eram S.Rao (2013) Principles of Food science- A Practical Manual
8. Eram S.Rao (2013) Food Quality Evaluation
9. Indian food Industry Journals- AFST Pbs
10. J of Food Sc. And Technology- AFST Pbs

FND 1.3 HUMAN PHYSIOLOGY

Objective

To gain in depth knowledge of organ systems and physiological functions

Course Content**UNIT-1**

Digestive system- Anatomy of Gastrointestinal Tract including liver, pancreas & gall bladder, Physiological functions of Gastrointestinal Tract, Digestion and Absorption of Macro and micro nutrients, regulation of food intake.

Urinary system -Anatomy and functions of the kidneys, structure and types of Nephrons, renal physiology, Glomerular Filtration Rate and its regulation, Mechanism of urine formation, Maintenance of acid base balance, Water and electrolyte balance.

UNIT-II

Blood-Composition of blood, Functions of cellular components, their significance, blood Groups. Clotting of blood, Erythropoiesis.

Cardiovascular System- Structure of heart, cardiac cycle, cardiac output, Structure and functions of blood vessels, Blood pressure and its control mechanism. Brief outline of lymphatic system and immunity.

Respiratory system - Structural plan of respiratory system, Mechanism of respiration, pulmonary ventilation, Chloride shift, Control of respiration.

UNIT-III

Endocrine system - Endocrine glands, mechanism of hormone action, Syndromes resulting from hypo and hyperactivity of pituitary, thyroid, parathyroid, adrenal, pancreatic and other hormones.

Nervous system: Organisation, structure and function of Nervous system, structure and functions of neurons, Overview of physiological functions of neurotransmitters & spinal cord, structure and function of Brain, Blood Brain Barrier, role of nervous system in sensation, sleep, learning & Memory.

UNIT-IV

Skeletal system - Structure and functions of bone, Histology of bone tissue, bone formation, bone growth, bones and homeostasis, Types of bones and joints.

Muscular system - Structure, types and functions of muscle tissue, anatomy of muscle fiber, types of muscle fibres. Contractions of muscle fibers.

BOOKS

1. Tortora SJ and Grabowski SR (2004) Principles of anatomy and Physiology. New York, John Wiley and Sons
2. McArdle W, Katch F, Katch V (1996) Exercise Physiology. Energy, Nutrition and Human Performance. 4th ed. Williams and Wilkins, Philadelphia
3. Stuart Ira fox (2008) Fundamentals of Human Physiology,
4. S.B.Bhise, AV.Yadav, Nirali Prakashan (2005) Human Anatomy and Physiology
5. B.D. Chaurasia (1996) Handbook of General Anatomy, 3rd ed.
6. Sujata.k.Chandhuri, Physiology, Council Medical Physiology, NCBA (Publishing) Ltd. Kolkata, India
7. Textbook of Medical Physiology – Guyton, 8th edition, HBJ International Edition, WB Sanders

1.4 ADVANCED NUTRITION I

Objectives

1. To understand the sources of macro and micro nutrients.
2. To become proficient for specialization in nutrition
3. To develop competence to carry out investigations in nutrition.

Course Content

UNIT-I

Introduction to Nutrition Science, Progress of nutrition research in India, Recommended Dietary Allowances, Energy- Components of Total Energy Expenditure (TEE), Factors affecting TEE, Measurement of Energy expenditure, Energy content of foods, Estimating Energy requirements, associated nutritional problems of energy imbalance- Under nutrition & Obesity

UNIT-II

Carbohydrates- Types, Functions, sources, dietary requirements and recommended allowances, Glycaemic index of foods, Fructo oligo saccharides, Dietary Fibre, sources, requirements and its role in prevention of disease.

Proteins - Types, Functions, sources and recommended allowances. Functions of amino acids. Quality of Proteins, PDCAAS, Protein Energy Malnutrition.

Lipids- Functions, types, sources and the recommended allowances, Essential fatty acids, functions, requirements and its deficiency, Role of n3 & n6 in health and disease, Overview of Trans fatty acids , Prostaglandins & Cholesterol . Nutritional importance of Medium Chain Triglycerides.

UNIT-III

Vitamins- Water and Fat soluble Vitamins –Sources, functions, deficiency symptoms, toxicity, bioavailability and recommended allowances

Minerals- Ca, P, Mg, Na, K and trace minerals, Sources, functions, deficiency, toxicity, bio availability and recommended allowances

UNIT-IV

Food, Nutrient & drug interactions- , Nutraceuticals & Functional foods in prevention of diseases, Nutritional regulation of Gene expression- Influence of Gene-Nutrient interactions on metabolic processes & Gene expression

BOOKS AND JOURNALS

1. Shills ME, Olson JA, Shike N, Ross AC (1999): Modern Nutrition in Health and Disease. 9th Ed. Williams and Wilkins
2. Mahan LK & Ecott- Stump S (2000): Krause's Food, Nutrition and Diet therapy, 10th ed. WB Saunders Ltd.
3. Anderson L, Dibble M, Mitchell N (1982) Nutrition in health and disease (17th ed). Philadelphia: JB. Lippincott co.
4. McArdle W, Katch F, Katch V (1996) Exercise Physiology. Energy, Nutrition and Human Performance. 4th ed. Williams and Wilkins, Philadelphia
5. Bamji M, Prahlad Rao N, Reddy V (2000). Text book of Human Nutrition. Oxford and IbH publishing Co. Pvt. Ltd.
6. Guthrie H (1986) Introductory Nutrition. 6th Ed. Mosby College Pbs.
7. Michele JS, Sadler J, strain J, Benjamin C (1999) Encyclopedia of Human Nutrition. Vol I to III. Academic Press.
8. Ganesh and Co., Williams S (1981) Nutrition and diet therapy. 4th Ed. Missouri. Masby co. Pbs.
9. Swaminathan M (1985) Essentials of Food and Nutrition. Vol I and II.
10. Gopalan C and Narasinga Rao B (1988) Dietary Allowances for Indians. NIN
11. Nutrition Reviews
12. Annals of Nutrition and Metabolism
13. British J of Nutrition

FND 1.5. FOOD CHEMISTRY

1. Qualitative tests for identification of different sugars
2. Estimation of reducing sugars by Lane –Eynons method
3. Microscopic examination of starch from different sources
4. Gelatinization temperature of range and % sag of various cereal starches
5. Experiment on Hydrolysis of starch from different sources
6. Experiment on Properties of Starch and dextrin
7. Determination of Hydroxy methyl furfural in honey
8. Precipitation reactions of proteins, colour reactions of proteins, Reactions of Albumin, Casein and Gelatin.
9. Development of Gluten from various flours and study of its properties
10. Determination of Specific gravity of foods (Milk & Oils)
11. Determination of Acid value of different oils
12. Determination of peroxides value of oils
13. Evaluation of the quality of oils after deep fat frying
14. Determination of pH of different foods using a pH meter
15. Estimation of Chlorophyll content in vegetables
16. Estimation of polyphenol content in fruits and vegetables

FND 1.6. FOOD SCIENCE

1. Survey of locally available foods in the market
2. Preparation of recipes using different cooking methods- Boiling, pressure cooking, grilling, simmering, poaching, stewing, frying, roasting and baking
3. Sensory Evaluation of Foods using different sensory tests
4. Factors affecting Gelatinization & Dextrinization of cereal starches. Preparation of recipes based on gelatinization & Dextrinization
5. Study of Stages of sugar cookery. Preparation of recipes using different stages of sugar cookery.
6. Study of germination of whole pulses.
7. Fermentation in cereals and pulses. Preparation of recipes using fermentation method
8. Factors affecting coagulation of milk proteins. Recipes using milk and milk products
9. Gel formation in foods, preparation of recipes using gelatine and egg protein
10. Demonstration of ferrous sulphide formation in boiled egg. Recipes based on role of eggs in cookery.
11. Effect of different methods of cooking on flavour, colour, texture, appearance and palatability of flesh foods
12. Determination of the creaming volume of fat by pound cake test
13. Effect of various cooking factors on pigments and texture of vegetables.
14. Effect of enzymatic browning in fruits and vegetables
15. Maillard reaction as a non enzymatic reaction in the preparation of various baked goods

FND 1.7. COMPUTER APPLICATIONS

1. Computer Fundamentals: Types of computers, parts of a computer system, Input-process-output operations, input and output devices, CPU, main memory, secondary storage media
2. Computer operations: Basic computer terminology, formatting storage media, working with files and folders, making backups, care of computer systems and secondary storage media
3. Computer software: System software and application software.
4. Computers in education: Interactive lessons, advantages and disadvantages of computer based learning, data management
5. The Internet: LAN, WAN, browsers, search engines, net etiquette and safety, electronic mail.
6. Computers in public utilities and services: Postal mail, Utility billing
7. Computer graphics: Vector graphics and Bitmap graphics
8. Document processing: Introduction, Menus, Tool bar, Create, Edit, Save, Alignment, Font Size, Formatting, Tables, Fill Colors, Mail Merge, Page Setup, Preview, Header, and Footer & Clip art.
9. Multimedia presentation: Multimedia basics, creating a multimedia presentation, simple screen designs, flow within the presentation, storyboarding
10. PowerPoint presentations: Introduction Menus, Tool bar, Create, Edit, Save, Slide transition Insert image , Hyper link, Slide numbers, View slide show with sound , Photo album , Clip art.
11. Spreadsheets: Introduction, Menus, Tool bar, Create, Edit, Save, Formatting cells, Chart wizard, Fill Colors, Creating and using formulas, Sorting & Filtering.
12. Databases: Introduction, Menus, Tool bar, Create, Edit, Save, Data types, Insert, Delete, Update, View, Sorting and filtering, Queries, Report , Page setup & Print

2.1. FOOD PROCESSING AND PRESERVATION TECHNOLOGY

Objectives

1. Knowledge of basic and applied aspects of food processing and technology
2. Knowledge of principles and methods of preservation
3. Knowledge of potential use of various by-products of food industry

Course Content:

UNIT I

Principles of food processing and preservation- Preservation by Low and high temperatures, Canning, osmotic pressure, Irradiation, dehydration & drying, Food additives, Definition, types, importance and industrial uses of Food additives. Equipments commonly used in processing and preservation of foods, by product utilisation from food processing industries.

UNIT II

Technology of food processing- Processing technology of cereals, legumes, oilseeds, fruits & vegetables, milk & milk products and animal foods. Examples of processed foods with value addition.

UNIT III

Food fortification and enrichment technology-current trends & applications. Fermentation technology of various fermented products, Milk products, beverages, vegetables, fermented soya products. Extrusion technology- advantages and disadvantages, Food safety and quality control- Food adulteration, Food laws and regulations, FSSAI and its role, Hygiene , Methods of quality control in food industries, GMP, GHP,HACCP,

UNIT IV

Food Packaging technology- recent Concepts, basic packaging materials, Effects of packaging on nutritive value of foods, packaging of different food products. Nutrition labelling, recent developments in Food Labelling.

BOOKS AND JOURNALS

1. Sri Lakshmi B (2004) Food Science. New Age Int.
2. Pecham GG (1972), Foundation of food preparation.. Mac millan Pbs.
3. Subbulakshmi G and Udipi A. 2004. Food Processing and Preservation techniques. New Age Int.
4. Swaminathan M (1992) Handbook of Food Science and Experimental foods. 2nd Ed. Bangalore.
5. Potter NH and Hotchkiss JH (1996) Food Science. 5th ed. New Delhi, CBS pbs.
6. Sethi M and Rao SE (2001) Food science experiments and application. CBS pbs. New Delhi.
7. Fellows PJ (2000) Food Processing Technology. Principles and Practice. 2nd Ed. CRC Woodhead Pbs. Cambridge.
8. Sumathi R.Mudambi, Shalini M Rao, M.V. RajaGopal (2006) Food Science by New Age International Publishers
9. Journal of Food chemistry
10. Indian food Industry Journals- AFST Pbs
11. J of Food Sc. And Technology- AfST Pbs.
12. Food and Nutrition News

FND 2.2. FOOD ANALYSIS AND INSTRUMENTATION

Objectives

1. To obtain knowledge and hands on experience in various aspects of food analysis.
2. To obtain knowledge in principles of instrumentation

Course Content**UNIT-I**

General principles of sampling of foods for analysis. Principles and methods of estimation of moisture, Ash as an indicator of total mineral content. Methods of estimation of Ash. Estimation of Calcium, phosphorus & iron from ash solution.

UNIT-II

Carbohydrates- Methods and principles of starch determination, different methods of analysis of sugars.

Crude fibre and fibre fractions- methods of determining fibre fractions, soluble, insoluble and neutral detergent fibre estimation.

Total fat- methods and principles of estimation of fats, methods of separation of lipid fraction and determination of neutral glycerol, fatty acids, phospholipids and cholesterol in foods

UNIT-III

Total Proteins- principles and methods of determination of Protein nitrogen and non-protein nitrogen. Principles in Micro and Macro determination of nitrogen by Kjeldahl method, other methods of protein estimation- biuret method, lowry Method, dye binding method and enhanced Dumas method, advantages and disadvantages. Vitamins- methods of estimation of Vitamins from foods, Estimation of Vitamin A, thiamine, riboflavin and Vitamin C

UNIT IV

Food analysis Instrumentation- Principles and application of colorimetry, spectroscopy, flame photometry, atomic absorptiometry, Principles and Application of Chromatographic procedures in food analysis, paper, thin layer and column chromatography with suitable examples. Instrumental measure of viscosity, Rheology and texture of various foods- dough, baked products, fruits, vegetables, dairy products, meat and meat products.

BOOKS

1. Berk. Z. Introduction to the Biochemistry of food, Department of food engineering & Bio technology, Izreal Institute of Technology, Haila (Izreal) Amsterdam, Oxford, New Yor.
2. Clifton. E. Meleon, Food analysis 3rd edition (Therory & practice) Yeshajahu Pomerrauz.
3. David & Robinson, Food biochemistry & nutritional value.
4. Dennis D. Meller Awiley , Food chemistry, A Laboratory manual by– Inter science publication John Wiley & Sons, INC.
5. Seemayadav (1997) Food Chemistry S, Author publication of Anmol Pvt. Ltd., 437/4B Ansari Road, Daryaganj, New Delhi..
6. Owen R. Fennema, Food chemistry 2nd edition Revised & Expanded.
7. Sathe (1999) A First Course In food Analysis
8. Yeshajahu P, Clifton E & Meloan , Food Analysis-Theory & Practice

FND 2.3. NUTRITIONAL BIOCHEMISTRY

Objectives

1. To understand the biochemical changes and activities of human system
2. To get an insight into interrelationships between various metabolic pathways

Course Content**UNIT I**

Carbohydrate metabolism- Classification of carbohydrates, biochemical functions, Glycolysis, TCA cycle, HMP Shunt, energetics of aerobic and anaerobic breakdown, Glycogenesis, Glycogenolysis, Gluconeogenesis and Regulation, Regulation of blood glucose, Altered metabolism in Diabetic Mellitus.

Enzymes- Classification, biochemical functions, intracellular distribution of enzymes, Enzymes in clinical diagnosis (SGPT, SGOT, alkaline phosphatase).

UNIT II

Protein metabolism- Classification of proteins; Amino acids and its classification, Pathway of entry of amino acids into TCA cycle; Transamination, deamination (oxidative and non-oxidative pathway); Decarboxylation for amino acids, Detoxification of ammonia, Urea cycle, Protein biosynthesis (Transcription and Translation), Creatine and creatine synthesis.

Metabolism of nucleic acids- Biosynthesis and degradation of purine and pyrimidine ring nucleotides. Biosynthesis and degradation Haemoglobin

UNIT III

Lipid Metabolism- Classification, functions, Biosynthesis and oxidation of fatty acids, Ketosis and control mechanisms and steps of ketone bodies formation, cholesterol synthesis; bile acids metabolism.

Biological oxidation: Concept of enzyme system and carriers in oxidation chain reactions, respiratory chain components, functions, redox potentials, energy carriers and oxidative phosphorylation

UNIT IV

Vitamin and mineral metabolism- biosynthesis, biochemical functions of vitamins (A, D, C, K, B vitamins) and minerals (Ca, Fe, P, Mg, Na, K, I)

Inborn errors of metabolism- Alkaptonuria, Phenylketonuria, Albinism, Homocystinuria, Cystinuria, Maple Syrup Urine Disease, Galactosemia, Glycogen storage disease, Fructosuria and Pentosuria.

BOOKS

1. Murray RK, Granner DK, Victor WR (2006) Harper's illustrated biochemistry, 27th ed. Mc Graw Hill Lange.
2. RamaRao AVSS (2000) a text book of Medical Biochemistry. New Delhi: UBS
3. Delvin TH (1997) Text book of biochemistry with clinical correlations. New York. John Wiley Pbs.
4. Lehninger A (1993) Principles of Biochemistry.
5. Ramakrishna S (1989). A text book of medical Biochemistry. New Delhi: UBS
6. Oser BL (1970) Hawk's physiological chemistry. New Delhi: Tata McGraw Hill.
7. J of Nutritional Biochemistry
8. Devala Rao G, A Manual Of Practical Biochemistry, Birla Publications Pvt. Ltd.
9. Yadav M, Nutritional Biochemistry And Metabolism, Arise Pbs.
10. Radha Rao SS, A Text Book of Advanced Biochemistry, Vikas and Co Pbs.

FND 2.4. ADVANCED NUTRITION II

Objectives:

1. To Understand the importance of diet in health and disease conditions
2. To impart knowledge on the importance of nutrition during life span.

Course Content:**UNIT I**

Introduction to diet therapy, Menu planning- principles, factors to be considered, food guide pyramid and food exchange lists. Balanced diet, Food security, Standardization of recipes and portions. Therapeutic diets- Modification of normal diet to suit special needs. Routine hospital diets, special feeding methods, pre and post operative nutrition, commercial formula feeds. Nutrition support services.

UNIT II

Nutritional Requirements and diet management through life cycle- Infancy, Preschool, School going, Adolescence, Adults, old age, Expectant and Lactating Mothers, Importance of Colostrum, Advantages of Breast feeding & Complementary feeding, Nutrition related problems in different age groups.

UNIT III

Nutritional Requirements and diet management in overweight, obesity, underweight, Food allergies, Fevers- Acute and chronic.
Nutritional problems in India, Nutrition Intervention Schemes & Programmes operating in India, National Nutrition Policy, Role of various National and International agencies in combating Malnutrition

UNIT- IV

Assessment of nutritional status – Anthropometry, clinical examination, laboratory and biochemical assessment, different methods of dietary assessment and vital health statistics. Importance of nutrition education for improving the nutrition status of community.

BOOKS AND JOURNALS

1. Shills ME, Olson JA, Shike N, Ross AC (1999): Modern Nutrition in Health and Disease. 9th Ed. Williams and Wilkins
2. Mahan LK & Escott- Stump S (2000): Krause's Food, Nutrition and Diet therapy, 10th ed. WB Saunders Ltd.
3. Srilakshmi B (2012) Nutrition Science. 4th ed.
4. Srilakshmi B (2005) Dietetics, 5th ed. New age International (P) Ltd. Pbs.
5. Gopalan C (1996) Nutritive value of Indian foods. NIN. Hyderabad.
6. Bamji M, Prahlad Rao N, Reddy V (2000). Text book of Human Nutrition. Oxford and IbH publishing Co. Pvt. Ltd.
7. Guthrie H (1986) Introductory Nutrition. 6th Ed. Mosby college Pbs.
8. Michele JS, Sadler J, strain J, Benjamin C (1999) Encyclopedia of Human Nutrition. Vol I to III. Academic Press.
9. Ganesh and Co., Williams S (1981) Nutrition and diet therapy. 4th Ed. Missouri. Masby co. Pbs.
10. Swaminathan M (1985) Essentials of Food and Nutrition. Vol I and II.
11. Gopalan C and Narasinga Rao B (1988) Dietary Allowances for Indians. NIN
12. Nutrition Research Reviews
13. American J Clinical Nutrition
14. British J of Nutrition

FND 2.5. FOOD PROCESSING AND PRESERVATION TECHNOLOGY

- I. Preparation , packaging, storage and shelf life studies of following food products
 1. Squashes and juices from locally available fruits
 2. Mixed fruit jam, guava jelly, morabba, marmalade
 3. Candied peels and jelly crystals
 4. Tomato ketchup and green chilli sauce
 5. Pickles and chutneys from mango, tomato, lime, carrots etc.
 6. Dehydrated products from vegetables
 7. Papads from sago, rice, dal
 8. Salad dressings

- II. Visits to: Food analysis laboratories, Bakeries, Food processing Industries & Food packaging industry

FND 2.6. FOOD ANALYSIS AND INSTRUMENTATION

1. Different methods of sampling of foods for food analysis.
2. Determination of moisture in different foods
3. Estimation of Ash value in different foods and preparation of Ash solution
4. Estimation of Fibre in foods
5. Estimation of Protein content in foods by Kjeldahl method
6. Estimation of Fat content in foods by Soxhlet method
7. Estimation of total sugars and reducing sugars
8. Estimation Calcium content of foods
9. Estimation of Phosphorus content in foods
10. Estimation of Iron content in foods
11. Estimation of Vitamin C in foods
12. Determination Saponification value, Iodine value, Free fatty acid value and Peroxide value of fats and oils
13. Determination of Refractive Index of fats and oils
14. Determination of Oxalic acid content in foods
15. Determination of tannin content of foods

FND 2.7. NUTRITIONAL BIOCHEMISTRY

1. Complete Blood Count, Blood Grouping, Measurement of Blood Pressure & Pulse rate
2. Glucose: Qualitative tests for glucose, Estimation of Glucose in blood and urine
3. Estimation of Serum Albumin, Globulin & Albumin/Globulin Ratio
4. Estimation of Haemoglobin
5. Estimation of Serum Calcium, Phosphorus and Iron
6. Estimation of Serum Cholesterol
7. Estimation of urea in serum and urine
8. Estimation of Creatinine in serum and urine
9. Estimation of Bilirubin in Serum
10. Estimation of Serum phospholipids
11. Estimation of Serum Alkaline Phosphatase
12. Urine Analysis

FND 2.8. ADVANCED NUTRITION II

1. Exchange list preparation & Standardization of recipes
2. Planning, preparation & evaluation of various therapeutic diets - Routine hospital diets, regular diet, light diet, soft diet, liquid diet, and tube feed, parenteral feeds
3. Planning, preparation & evaluation of diets for various age groups in life cycle keeping in mind various principles of menu planning
(Infancy, preschool, school-going, adolescents, adulthood, pregnant and lactation)
4. Planning, preparation & evaluation of diets for- obesity, underweight, fevers and infections, vitamin and mineral deficiency disorders.
5. Assessment of nutritional status of different age groups
6. Development of Audio visual aids and Presentation to the target groups for Nutrition education
7. Conducting Dietary survey of different age groups using different methods

FND 3.1. FOOD MICROBIOLOGY & TOXICOLOGY

Objectives:

1. Understand the field of Food Micro biology and its relevance to everyday life
2. To prevent food borne infections and food poisonings
3. Understand various toxic factors in foods

Course Content:

UNIT I

Introduction to food microbiology- Microorganisms and their general characteristics- fungi (moulds and yeast), bacteria and viruses. Intrinsic and extrinsic factors affecting microbial growth. Importance of probiotics and prebiotics.

UNIT II

Food Safety-Sources of contamination and spoilage of different kinds of food and their products (cereals, pulses, fruits and vegetables, milk and milk products, egg, meat and meat products, fish). Food poisoning and food infections- causative agents, symptoms and prevention. General bacterial and viral diseases of man. Pathogenic yeasts and moulds.

UNIT III

Microbiological techniques-Sterilization and disinfection: Sterilization by physical & other types of sterilisation,. Outline of methods of Isolation and detection of microorganisms in food

UNIT IV

Toxicology Definition, classification of food toxicants, Non-organic and organic metallic contaminants, Endogenous toxicants in food derived from plants, cyanogenic glycosides, Vasoactive amines, Psychoactive compounds, Lathyrogens, plant polyphenolic substances, Flavones, Chalcones, Carcinogens, Phytoestrogens & toxic fatty acids. Toxic mushrooms and other macro fungi, Toxicology of marine foods: Molluscs, Fish and marine algae. Food toxins and implications on human health: Neurotoxicity, Hepatic toxicity, Nephro toxicity, Haemotoxicity, skeletal toxicity, reproductive toxicity, allergenicity, Teratogenic effects, Carcinogenic and miscellaneous manifestations.

BOOKS AND JOURNALS

1. Bharucha FD and Mehta A (2000) Handbook of microbiological methods and media. Sevak Printers (pbs)
2. Frazier WC and Westhof DC (1978) Food Microbiology. New Delhi. Tata Mc Graw Hill
3. James MJ (1996). Modern Food Microbiology. 4th edition, New Delhi CBS(pbs)
4. Pelezar MJ, Reid RD and Chan (1977). Microbiology. New Delhi. Tata Mc Graw Hill
5. Stanier rY, Ingraham JL, Wheelis ML, Painter PR(1986) General Micro Biology. Mc Millan Education Ltd. London.
6. Joshua AK (1988) Microbiology. Popular book Dep.
7. Jose M. Concon, Mareel Dekker (1988) Food Toxicology, Part-A.& Part B, Principles and concepts by, Inc., New York.
8. Deshpande (2002)Hand Book of Food Toxicology
9. Indian Food Industry Journals, AFST Pbs.
10. J food Sc and Technology Journals. AFST Pbs.

FND 3.2 CLINICAL AND THERAPEUTIC NUTRITION

Objectives:

1. To understand the importance medical nutrition therapy in disease conditions
2. To understand various clinical parameters in disease conditions

Course Content:**UNIT-I**

Gastro Intestinal Diseases- Gastro Esophageal Reflux Disease, esophagitis , peptic ulcers, malabsorption syndrome, celiac disease, lactose intolerance, Inflammatory Bowel Diseases, Irritable Bowel Syndrome, hepatitis, alcoholic liver disease, cirrhosis, hepatic coma and gall stones- etiology, Symptoms, complications, clinical parameters, diagnostic tools and Medical Nutrition Therapy of Gastro intestinal diseases

UNIT-II

Diabetes mellitus- IDDM, NIDDM, Diabetic keto acidosis, Diabetic Nephropathy, Gestational diabetes - etiology, symptoms, complications, clinical parameters, diagnostic tools and Medical Nutrition Therapy for diabetes mellitus and complications. An overview of Glycosylated Haemoglobin, Glucose Tolerance Test, Oral hypoglycaemic drugs, Insulin therapy, Glycemic Index of foods.

Renal disorders – Glomerular nephritis, Nephrotic syndrome, Acute & chronic renal failure and renal calculi- etiology, symptoms, complications, clinical parameters, diagnostic tools and Medical Nutrition Therapy of renal disorders

UNIT-III

Cardio Vascular Disorders - Atherosclerosis, myocardial infarction, Congestive heart failure, hypertension and hyperlipidemias- Etiology, symptoms, complications, clinical parameters, diagnostic tools and Medical Nutrition Therapy of cardio vascular disorders

Pulmonary Disorders- Bronchitis, Chronic obstructive pulmonary disease, cystic fibrosis - Etiology, symptoms, complications, clinical parameters, diagnostic tools and Medical Nutrition Therapy of cardio vascular & Pulmonary disorders.

UNIT-IV

Rheumatic Disorders - Osteoarthritis & gout

Neurological Disorders- Alzheimer's disease, & epilepsy

Inborn disorders of metabolism - Phenyl ketonuria, Maple syrup urine disease, Galactosemia & Fructosuria -Etiology, symptoms, complications, clinical parameters, diagnostic tools and Medical Nutrition Therapy of Rheumatic, Neurological Disorders & Inborn disorders of metabolism

BOOKS AND JOURNAL

1. Shills ME, Olson JA, Shike N, Ross AC (1999): Modern Nutrition in Health and Disease. 9th Ed. Williams and Wilkins
2. Mahan LK & Ecott- Stump S (2000): Krause's Food, Nutrition and Diet therapy, 10th ed. WB Saunders Ltd.
3. Srilakshmi B (2005) Dietetics, 5th ed. New age International (P) Ltd. Pbs. New Delhi
4. Gopalan C (1996) Nutritive value of Indian foods. NIN. Hyderabad.
5. Michele JS, Sadler J, strain J, Benjamin C (1999) Encyclopedia of Human Nutrition.
6. Ganesh and Co., Williams S (1981) Nutrition and diet therapy. 4th Ed. Missouri. Masby co. Pbs.
7. Gopalan C and Narasinga Rao B (1988) Dietary Allowances for Indians. NIN
8. Nutrition Research Reviews
9. American J Clinical Nutrition
10. British J of Nutrition
11. J of American Dietetic Association
12. Indian J of Nutrition and Dietetics

FND 3.3. INSTITUTIONAL FOOD ADMINISTRATION

Objectives

1. Understanding planning, preparation and service of food in large quantities by taking into consideration economic level and the type of food.
2. Understanding the factors affecting the organization and administration of food service.
3. Understanding type of Institution where the food service is housed.

Course Content**UNIT I**

Introduction to Food Service industry - Objectives, scope, Organisation chart of Dietary/Food Service Department, Types of food service systems – Centralised and Decentralised. Introduction to the complex nature of medical food service management, roles and responsibilities of the health care team. Staff and personnel management- Manpower Planning, Recruitment, Selection, Induction, Performance Appraisal and Motivation, Training and Development, Labour Laws, Need and process of communication.

UNIT II

Planning and equipment purchase- Layout Design: Space allowances, design development, space relationship, flow of traffic Equipment, Factors affecting selection of equipment; features of equipment, List of Equipment required specific to Dietetics/ Food Service Department: receiving, preparation, cooking, service, washing and garbage disposal, Care, maintenance and replacement.

UNIT III

Service Management- Table service, Dining room management, Delivery and service of food in different institutions

Materials Management- Meaning, definition, importance, purchase and inventory management, Methods and process of purchase, documents used in purchase control, Store Keeping: Principles, essentials and duties of store keeper, Storing and issuing control.

UNIT IV- Costing- Definition of cost, Elements of cost, Material (Food) Cost, Labour, Overheads and calculation of percentages, Concept of profit, gross profit, after-wage profit, net profit and calculation of percentages, Cost profit volume analysis, Budget and budgetary control for food service institutions.

BOOKS

1. Mohini Sethi & Surjeet Malhan (1987) Catering Management. An Integrated Approach. Wiley Eastern Ltd. New Delhi.
2. Awatramani P (1980). Catering management for Indian Hotels. Bombay. Popular Book depot.
3. Bessie B and West Le Wood (1986) Food Service in Institutions (6th Ed.) Macmillan Publishing Co.
4. Buttle F (1992) Hotel and Food Services marketing- a managerial approach. London ELBS/Casell
5. Lillicrap DR (1998) Food and Beverage service, 5th ed. London: ELBS/Hader and Stoughton

FND 3.4. RESEARCH METHODOLOGY AND STATISTICS

Objectives

1. Understand the importance of research methods and its applications
2. Understand different statistical methods and their applications in research

Course content

UNIT I

Meaning, significance and objectives of research, criteria of good research, different types of research, Current research areas in Foods and Nutrition. Research process- selection and statement of research problem, statement of hypothesis and types of hypothesis, principles and formulation of hypothesis. Research variables- meaning and their significance in research, types of variables, selection and measurement of variables.

UNIT II

Techniques and methods of data collection. , Research Design, different types of research design, Sampling, types of sampling methods, merits and demerits of sampling methods

UNIT III

Meaning and scope of statistics, role of statistics in research, statistical representation- Parts of table, tabulation of data, Frequency distribution, Diagrammatic and graphical representation, Measures of central tendency, measures of dispersion and variation, skewness and kurtosis, concept of probability and normal distribution

UNIT IV

Analysis and Interpretation of statistical data- Testing of hypothesis, Parametric and Non parametric tests- Chi-square test, application of Students t' test, Correlation, Regression and prediction, ANOVA- Analysis of variance- One way and two way classification, Sign test, Wilcoxon signed-ranks test, Mann-Whitney U test and Kruskal-Wallis test

BOOKS

1. C.R. Kothari. "Research Methodology – methods & techniques" 2nd edition, New Age International publishers, New Delhi, 1985.
2. Misra RP (2001) Research Methodology, Concept Pbs. New Delhi
3. Alan Bryman (1998) Quantity and Quality in Social Research, Unwin Hyman Ltd. UK
4. Basotia G and Sharma KK (1999) Research Methodology. Mangal Deep Publications, Jaipur
5. Burns RB (2000) Introduction to Research Methods. Sage Publications Pvt. Ltd.
6. Krugner RA. Focus groups- Practical guide for applied research. Sage Publications Pvt. Ltd.
7. Deepak Kumar Bhattacharya, Research Methodology, , Excel Book publishing, New Delhi.
8. Fisher A.R. Yates. I. "STATISTICAL TABLES" 6th edition Longman group ltd., England.1982.
9. Freud. E.J .Smith. M.R. "STATISTICS- A FIRST COURSE" 4th edition, Prentice-hall-inc, New Jersey.
10. Sancheti DC & Kapoor VK (2005) Statistics (Theory, Methods & Application).Sultan chand & sons (pbs).

FND 3.5. FOOD MICRO BIOLOGY & TOXICOLOGY

1. Study of principles and types of compound microscope.
2. Preparation of common laboratory media for cultivation of bacteria, yeast and moulds.
3. Inoculation techniques and different methods of isolation of microorganisms.
4. Staining of bacteria: Gram's staining, acid fast, staining of yeasts and moulds.
5. Study of microbiological analysis in the food preparation area.
6. Study of microbiological flora of both processed and unprocessed foods like vegetables and fruits, cereals, spices and canned foods.
7. Bacteriological analysis of water and milk: total count and MPN coli form count.
8. Compare the growth of microorganisms:-
 - (a) In jams/ sauces (hypotonic).
 - (b) Temperature zones (cold, hot and room temperature).

FND 3.6. CLINICAL AND THERAPEUTIC NUTRITION

- I. Computation of nutrient requirements, planning, preparation & evaluation of therapeutic diets for the following conditions.
 1. Gastro Intestinal Diseases
 2. Diabetes mellitus & its complications
 3. Renal disorders
 4. Cardio Vascular Disorders
 5. Pulmonary Disorders
 6. Rheumatic Disorders
 7. Neurological Disorders
 8. Inborn disorders of metabolism
- II. Diet counselling of patients
- III. Case study writing and interpretation of cases based on clinical parameters.

FND 3.7. RESEARCH METHODOLOGY AND STATISTICS

1. Development of research tools – Questionnaire, Observation, Interview schedule, check list & Inventory.
2. Development of research proposals
3. Writing research articles- Abstract, Review & research papers for journals, chapter in a book, popular articles , thesis writing & project report writing
4. Critical interpretation of research papers bringing its strengths and limitations
5. Statistical data representation- Tabulation, diagrammatic and graphical representation
6. Intensive practical experience in – Frequency distribution, measures of central tendency & dispersion, correlation & regression, skewness and kurtosis, normal distribution, parametric & non parametric methods of testing hypothesis

FND 3.8. DISSERTATION AND SEMINAR

Seminar on any relevant topic within the course of study to be prepared and presented as Dissertation. Dissertation to be undertaken as a pilot research study or project in the relevant field or a review work of publishable standard. The same project or research work may be continued in the 4th Semester.

FND 4.1.NUTRITION IN CRITICAL CARE AND DIET COUNSELLING

Objectives

1. Understand the physiology, metabolism and special nutritional requirements of the critically ill.
2. Be familiar with the special nutritional support techniques and feeding formulations to meet the nutritional needs

Course Content

UNIT -I

Nutritional screening and nutritional status assessment of the critically ill, nutritional support systems and other life saving measures of the critically ill, Complications of critically ill patients

UNIT- II

Role of immune enhancers, conditionally essential nutrients, Immune suppressants, protein supplements, nutraceutical supplements, commercial feeding formulas & special diets in critical care

UNIT-III

Pathophysiological, clinical and metabolic aspects, special nutrient requirements, medical nutrition therapy in critical illnesses - Stress, trauma and burns, Pre and post surgery, Dialysis, transplants, Multiple organ dysfunction syndrome, HIV and AIDs, Cancers, Radiation and chemo therapy conditions

UNIT IV

Nutrition counseling, definition, concept, the roles of a dietitian, Counselling environment and equipment. Factors to be considered while counselling, designing of counselling plans, goals and objectives. Methods and Techniques of Diet Counselling.

BOOKS

1. Shills ME, Olson JA, Shike N, Ross AC (1999): Modern Nutrition in Health and Disease. 9th Ed. Williams and Wilkins
2. Mahan LK & Ecott- Stump S (2000): Krause's Food, Nutrition and Diet therapy, 10th ed. WB Saunders Ltd.
3. Anderson L, Dibble M, Mitchell N (1982) Nutrition in health and disease (17th ed). Philadelphia: JB. Lippincott co.
4. Srilakshmi B (2005) Dietetics, 5th ed. New age International (P) Ltd. Pbs. New Delhi
5. Gopalan C (1996) Nutritive value of Indian foods. NIN. Hyderabad.
6. Seth V and Singh K (1995) Diet Planning through life cycle in Health and disease- a practical Mannuel , 2nd ed. . New delhi. Wheeler Pbs.

FND 4.2. SPORTS NUTRITION

Objectives

1. To understand the physiological and biochemical events which occur in a variety of exercise conditions
2. To understand the recommendations for nutrients and diet for sports persons

Course Content**UNIT -I**

Role of sports and exercise in promoting health, delay in onset of diet related disorders, Control / Management of diseases such as Diabetes, Heart diseases and Neuroendocrine, Respiratory diseases and Musculo skeletal disorders by exercise, different categories of sports activities in India, Energy systems and exercise – ATP, CP, aerobic & anaerobic pathway.

UNIT- II

Nutrition & Performance- Energy requirements, Carbohydrate requirements, Carbohydrate loading, Carbohydrate utilization during exercise, Lipids-- Fat Metabolism and utilization during exercise, Fat loading & requirements, Proteins, requirements, Sources of proteins. Vitamins & Minerals- requirements, functions, role of vitamins and minerals in sports performance, Phosphate loading, Magnesium, calcium, sodium, potassium and chloride

UNIT-III

Hydration, guidelines, types of fluids, fluid volume, composition, temperature, effects of dehydration, importance of sports drinks. Ergogenic aids, Types, effects and safety concerns, Functional foods available for athletes. Impact of Steroids on the performance of sports persons, safety issues of steroidal use, Training diet, Pre exercise meals – intake during exercise, feeding after exercise – Liquid v/s solid meals. Dietary modifications and diet plans for different sport events.

UNIT IV

Prevention and management of sports injuries- Causes of injuries, Basic principles of management of injuries, Orthotics and Proective sports equipment, Role of yoga for health and fitness.

BOOKS AND JOURNALS

1. Shills ME, Olson JA, Shike N, Ross AC (1999): Modern Nutrition in Health and Disease. 9th Ed. Williams and Wilkins
2. Mahan LK & Ecott- Stump S (2000): Krause's Food , Nutrition and Diet therapy, 10th ed. WB Saunders Ltd.
3. Anderson L, Dibble M, Mitchell N (1982) Nutrition in health and disease (17th ed). Philadelphia: JB. Lippincott co.
4. McArdle W, Katch F, Katch V (1996) Exercise Physiology. Energy, Nutrition and Human Performance. 4th ed. Williams and Wilkins, Philadelphia
5. Int. J of Sports nutrition and Metabolism
6. J of Dietary supplements
7. J of American Dietetic Association
8. American J of Clinical Nutrition

FND 4.3.NUTRITION IN CRITICAL CARE AND DIET COUNSELLING

Computation of nutrient requirements, planning, preparation & evaluation of therapeutic diets, formula diets and diet counselling methods for the following conditions.

1. Stress and Trauma
2. Burns
3. Pre and Post surgery conditions
4. Dialysis
5. Pre and post transplantation
6. HIV and AIDs
7. Radiation and chemo therapy conditions

FND 4.4. INTERNSHIP

Every candidate shall undergo professional training for 45 days in a Food Industry / Hospital / Community Centers like NGOs at the end of the Third semester of the course. At the end of professional training the student has to submit a report for which Viva will be conducted both by internal and external examiner.

FND 4.5. PROJECT WORK & DISSERTATION

Project work & Dissertation may be undertaken in the relevant field preferably on current issues. It can be continuation of the research work from the 3rd Semester. The thesis should be typed in Times New Roman in 12 font size with 1.5 line spacing from the beginning of the thesis including titles to the chapters and sections. Bold font may be used where ever necessary. The students are expected to follow scientific grammar for writing *in vivo* etc. which should be in italics.

Guidelines for writing the thesis:

The thesis should have the following pages in order:

1. Title page highlighting the title, name of the candidate, reg.no .guide name, college name and month and year of submission and the inner title page containing the same details on white background.
2. Certificate from the Head of the institute & Guide
3. Certificate from the ethical committees for approval of study, if any
4. Declaration by the student
5. Acknowledgements
6. Index highlighting chapter titles and sections titles
7. Index for tables, figures and plates, if any
8. Abbreviations and symbols
9. Materials used in the investigation with their procurement details like name of the company, batch number etc.
10. Equipment used in the study with the model number and other details.
11. Aim and objectives of the investigation.
12. Introduction and literature survey
13. Materials & Methods
14. Result
15. Discussion
16. Summary and conclusion
17. References

FND 4.6. COMPREHENSIVE VIVA-VOCE

Viva-voce will be conducted to test the knowledge gained by the student in all the four semesters (both theory & practical) and other relevant issues in the area of specialization