Second Semester

S. No.	Subject Code	Course Title	Course Category	Credit	Contact Hours Per Week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
1.	FHN 801	Nutritional Biochemistry-II	CCC	4	4	0	0	3	0
2.	FHN 802	Food Microbiology And Food Safety	CCC	4	4	0	0	3	0
3.	FHN 803	Human Nutritional Problems	CCC	4	4	0	0	3	0
4	FHN 811	Human Nutritional Problems	CCC	6	0	0	9	0	4
5	FHN B01	Statistics	ECC	4	4	0	0	3	0
6	FHN B02	Food processing	ECC	4	4	0	0	3	0
7	FHN B11	Nutritional Biochemistry – II	ECC	4	0	0	6	0	4
8	FHN B12	Food Microbiology	ECC	4	0	0	6	0	4
9	FHN B13	Food processing	ECC	2	0	0	3	0	4
				36					

CCC = 18,
ECC = 18
Total = 36 credits

Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

SEMESTER II

NUTRITIONAL BIOCHEMISTRY– II (THEORY)

Paper Code : FHN 801
Max. Marks : 100
Credits: 4
Teaching Hours : 4 Hours / Week
Total Teaching Workload: 60 Hours/ Semester

Objectives :

1. To understand the basic nature and role of bio molecules.
2. To understand the mechanisms adopted by the human body for regulation of metabolic pathways.
3. To get an insight into interrelationships between various metabolic pathways.
4. To link metabolic events occurring at the cellular level.
5. To become proficient for specialization in nutrition.

Contents:

UNIT- I

1. Vitamins

Biochemical role of

- Water soluble vitamins: C and B-Complex(B1, B2, Niacin, Pyridoxin, Pantothenic acid, Biotin, Folic Acid, B12)
- Fat soluble vitamins: A,D,E and K

2. Minerals

- Biochemical role of minerals(Calcium, Phosphorus, Iron, Potassium, Sodium, Chloride, Magnesium, Selenium and Zinc).

UNIT- II

3. Enzymes

Classification , co-enzymes , methods of isolation , purification and characterization , theories and mechanism of enzyme action , factors affecting reaction of enzyme – effect of time , temperature , pH substrate enzyme activator and inhibitor (types of inhibitors) , Km – it's derivation and significance , elements of thermodynamics , enthalpy , entropy and free energy , active site and specificity of enzymes.

4. Intermediary metabolism and it's regulation

- Carbohydrates – Glycolysis, TCA cycle, respiratory chain, high energy link, biological redox potential, Gluconeogensis, hexose monophosphate shunt.
- Lipids - α , ß and ω oxidation of fatty acids , ß oxidation of odd and even number

	fatty acids , synthesis of fatty acids , phosphatidic acid , ketosis , synthesis of cholesterol. • Proteins – absorption and conversion of amino acids , nitrogen fixation , degradation of ammonia and removal of amino acids through deamination , transamination , decarboxylation and urea cycle.
UNIT- III	
5.	Introduction to causative factors, biochemical and clinical manifestation, treatment and therapeutic measures of following Inborn errors of amino acid metabolism: • Phenylketonuria, • Hypertyrosinaemia, • Hypervalemia, • Hyperhistidinaemia, • Hyper lysinaemia, • Homocystinuria. Carbohydrate metabolism i.e. Pentosuria, galacetosaemia Lipid metabolism i.e. Hyper chylo-micronaemia, pure hyper-cholesterolaemia

References :

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5. Devlin TM. *Text Book of Biochemistry with Clinical Correction*. 7th ed. John Wiley & Sons Inc; 2010.
6. Fruton JS and Simmonds S. *General Biochemistry*. 2nd ed. NY: John Wiley & Sons Inc; 1958.
7. Harper HA, Rodwell VW and Mayes PA. *A Review of Physiological Chemistry*. 17th ed. Los Altos, CA: Lange Medical Library; 1979.
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10. McDevitt ME and Mudambi SR. *Human Nutrition: Principles and Applications in India*. 1st ed. ND: Prentice Hail Inc; 1973.
11. Nelson DL and Cox MM. *Lahninger: Principles of Biochemistry*. 4th ed. NY: WH Freeman; 2005.
12. Pike RL and Brown ML. *Nutrition: An Integrated Approach*. 3rd ed. NY: John Wiley & Sons Inc; 1984.
13. Robinson CH and Lawler M. *Normal and Therapeutic Nutrition*.17th ed.USA: Macmillon; 1990.
14. Rodwell VW, Bender AD, Botham KA, Kennelly PJ and Weil PA. *Harpers Illustrated*

Biochemistry. 30th ed. NY: McGraw Hill Education; 2015.
15. White A, Handler P and Smith EL.*Principles of Biochemistry*. NY: McGraw Hill; 1973.

FOOD MICROBIOLOGY AND FOOD SAFETY (THEORY)

Paper code: FHN 802
Credits : 4
Max. Marks:100
Teaching Hours :4 Hours/Week
Total Teaching Workload :60 Hours/Semester

Objectives :

1. To understand the role of micro-organisms in food, food spoilage and to understand advanced techniques of food preservation.
2. To learn about food-borne infections and intoxication.
3. To understand the criteria for microbiological safety in various food operations to avoid public health hazards due to food contamination.
4. To be able to understand the food safety and criteria for microbiological safety in various food operations to avoid public health hazards due to food contamination.

Contents:

UNIT I

1. History and development of food microbiology
2. Micro-organisms of importance in food- bacteria,mold and yeast. Classification, morphology and physiology.
3. Factors affecting growth of micro-organisms- pH, moisture, oxidation reduction potential, nutrients, temperature.
4. Principles of preservation
   - General principles of food preservation: asepsis, removal, anaerobic conditions
   - Preservation by use of
     drying,
     low temperatures
     high temperatures
     irradiation
     food additives

UNIT II

5. Contamination, preservation, and spoilage of different kinds of foods
   - Cereals and it's products
   - Sugar and it's products
   - Vegetables and fruits
   - Eggs
   - Milk and it's products
   - Canned foods
6. Microbiology of fermented foods.
   Vinegar, Cheese, Beer
   Indian fermented foods- Idli, Dosa, Vada, Curd

7.	Single cell proteins (SCP) Introduction to single cell proteins, types of single cell proteins, production of SCP, advantages and disadvantages
8.	Probiotics Introduction to probiotics, Overview of gut environment, types of probiotics, mechanism of action, health benefits, prebiotics
UNIT III	
9.	Role of Microbes in health and disease • Public health Hazards and Food borne illnesses due to microbial contamination Causes, food association, habitat, toxins, disease and symptoms, prevention of the following Food borne intoxications ▪ Botulism ▪ Staphylococci ▪ Mycotoxicosis Food borne infections ▪ Salmonella ▪ E. Coli ▪ Clostridium
10.	Food Safety requirements for different food service establishments and safety measures (a) Definition of food safety, regulatory agencies, WHO and FAO (b) Food Safety regulations and laws in India Food safety and regulations 2011 i) Part III Section 4 Sanitary and Hygienic Requirements for Street Food Vendors and Units other than Manufacturing/Processing. ii) Part II Section 4 Annexure 3 Conditions of License (c) Food security assurance systems i. Good Hygienic Practices (GHP) ii. Good Manufacturing Practices (GMP) iii. Food Safety Management Systems- HACCP iv. Food Safety Management System- ISO 22000 Quality Management System- ISO 9001
References :	
	1. Frazier WC and Westhoff DC. Food Microbiology, McGraw Hill Co. Ltd., New Delhi, IV ed., 2008. 2. Ananthanarayan R and Paniker's CKJ. Text book of Microbiology,VIII ed., International Universities Press, US, 2009. 3. Adams MR and Moss MO. Food Microbiology. Royal Society of Chemistry, UK, III ed., 2007. 4. Jay MJ, Loessner MJ and David GA. Modern Food Microbiology. Food Science Text Series, VII ed., 2005

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7. Banwart GJ. Basic Food Microbiology. AVI Publishing Co., Westport, Conn. (USA), II ed., 1995.
8. Khetarpaul N. Food Microbiology. Daya Publishing House, Delhi, 2006
9. Harrigan WF. Laboratory Methods in Food Microbiology. Gulf Professional Publishing, Oxford, UK, 1998.
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12. Food Microbiology and Safety Practical Manual. MFNL-003. Indira Gandhi National Open University of Continuing Education The Training Manual For Food Safety Regulators Who Are Involved In Implementing Food, Safety And Standards Act 2006 Across The Country , Volume II Food Safety Regulations and Food Safety management.
13. Foods Safety and Standards Authority Of India (Ministry Of Health and Family Welfare)
14. FDA Bhavan, Kotla Road, New Delhi – 110 002 Website: www.fssai.gov.in
15. Heritage J, Evans EGV and Killingtin RA. Introductory Microbiology. III Series. Combridge University Press, Great Britain, 1996.
16. Bhatnagar A. Microbiology (A Remediation Study), RBSA Publishers, Jaipur, 1995.
17. Sulla SB and Shantharam S. General Microbiology. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, 2000.
18. Bella C, Neaves P and Williams AP. Food Microbiology and Laboratory Practice. Blackwell Publishing, Oxford, 2006.
19. The Training manual for Safety Regulators and Food Safety Management, 2010, FSSAI.

HUMAN NUTRITIONAL PROBLEMS (THEORY)

Paper code: FHN 803
Credits : 4
Max. Marks:100
Teaching Hours :4 Hours/Week
Total Teaching Workload :60 Hours/Semester

Objectives:

1. To create understanding about nutritional assessment techniques applicable for individuals and community.
2. To create understanding of various nutritional problemsand their management initiatives taken by government.

Contents:
UNIT I

1.	Prevalence, etiology, biochemical and clinical manifestations, diagnostic technique,public health implications, preventive and therapeutic measures for the following nutritional problems: • Protein Energy malnutrition, programmes such as ICDS and CMAM. • Vitamin A deficiency, programmes such as Vitamin A prophylaxis program • Anaemia, programmes such as National Iron Deficiency Control program and WIFS • Iodine Deficiency Disorders, programmes such as NIDDCP

UNIT II

2. Prevalence, etiology, biochemical and clinical manifestations, diagnostic technique, public health implications, preventive and therapeutic measures for the following nutritional problems:
   - Fluorosis
   - Rickets, osteomalacia and osteoporosis
   - Beriberi
   - Pellagra
   - Scurvy
   - Zinc Deficiency

3. Food Safety and contamination
   - Naturally occurring toxins and anti-nutritional factors :
   - Lathyrism,
   - Epidemic dropsy.

UNIT III

4. Assessment of Nutritional Status, Various techniques for assessment of nutritional status:
   - Anthropometric measurements:
   - Definition, measurements, tools/instruments.
   - Techniques for measurements, standards for references, indices, classification, interpretation of data.
   - Use of anthropometry for onetime assessment, growth monitoring and emergency situation.
   - Biochemical estimations for diagnosis of protein energy malnutrition, vitamin A deficiency, anaemia, iodine deficiency disorders, fluorosis: Parameters, techniques for estimation, reference value
   - Clinical examination
   - Dietary Survey
   - Vital statistics

References :

1. Vir SC. Public Health Nutrition in Developing Countries Pt 1 and 2 . Published by Wood head publishing India PVT LTD, New Delhi. Cambridge, Oxford, Philadelphea.
2. Sehgal S and Raghuvanshi Rita S Textbook of Community Nutrition, Indian Council of Agricultural Research, Published by: Directorate of Information and Publication of Agricuture, Indian Council of Agriculture Reserach, KrishiAnusandhanBhavan, Pusa, New Delhi-110012
3. Bami MS, Rao PN and Reddy V. Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.1996.
4. Robinson CH and Lawler MR. Normal and Therapeutic Nutrition, Macmillon, NewYork, 1996.
5. Waterlow JC. Protein Energy Malnutrition, Edward Amold, A division of Hodder and Stoughton, 1992.
6. Sachdeva HPS and Chaudhary P (Eds). Nutrition in Children: Developing country concerns,

Department of Pediatrics, Maulana Azad Medical College, New Delhi, 1994.
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8. Passmore R and Eastwood MR. Human Nutrition and Dietetics, ELBS, Churchill Livingstone, London, Baltimore, 1986.
9. De Mayer EM. Preventing and Controlling iron deficiency anaemia through Primary Health Care, WHO, 1989.
10. JeliffeDS.The Assessment of Nutritional status of the community, WHO Geneva, 1966.
11. Gopaldas T and Sheshadri S. Nutritional Monitoring and Assessment, Oxford University Press, New Delhi, 1987.
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14. Beaton GH and Bengoa JM. Nutrition in preventive Medicine. The major deficiency syndrome Epidemiology and approaches to control, World Health Organization, Geneva, 1976.
15. Talwar GP. Textbook of Biochemistry and Human Biology, Prentice Hall of India Pvt. Ltd., New Delhi, 1980.

HUMAN NUTRITIONAL PROBLEMS (PRACTICAL)

Paper code: FHN 811
Credits : 6
Max. Marks:100
Teaching Hours :3 Practicals/ Week (3Hours/ Practical)
Total Teaching Workload : 45 Practicals/Semester

Objectives

1. To develop an understanding of the principles of various techniques of nutritional assessment.
2. To develop competence in recording and interpretation of anthropometric measurements.
3. To develop skills in conducting dietary surveys and data interpretation.
4. To develop understanding and skills in clinical observation.

Contents:

1. Preparation of event calendar of past five years for assessment of age.

2. Assessment of nutritional status of infants using anthropometric measurements :

- Preparation of questionnaire, learn techniques of recording weight length and MUAC.
- Data collection (at least 10 infants)
- Data interpretation using WHO Z scores and report.
- Data interpretation using WHO growth.

3. Assessment of nutritional status of preschool children using anthropometric measurements:

- Preparation of questionnaire , learn techniques of recording height and weight using bathroom weighing scale as well as Salter weighting balance and MUAC.

4.	• Data collection (at least 10 preschool children). • Data interpretation using WHO growth standards and report writing.
5.	Assessment of nutritional status of school going children using anthropometric measurements : • Preparation of questionnaire, data collection (at least 10 children). • Data interpretation using WHO growth standards and report writing. Assessment of nutritional status of adolescent boys and girls using anthropometric measurements. • Preparation of questionnaire and data collection. • Data interpretation using WHO growth standards and BMI for age and height for age indices and report writing.
6.	Assessment of nutritional status of adults using anthropometric measurements. • Preparation of questionnaire, learning techniques of measuring waist circumference and hip circumference and calculation of WHR. • Data collection.
7.	Determination of haemoglobin level in blood sample of any age group and interpretation and comparison of results using: Sahli's, hemochek and cyanmethhemoglobin technique
8.	Assessment of nutritional anaemia among college going students using haemoglobin estimation and clinical signs and symptoms of anaemia. • Preparation of questionnaire, learn the techniques. • Data collection (at least 10 students) • Data interpretation and report writing
9.	Assessment of nutritional anaemia among college going students using Haemoglobin estimation and clinical signs and symptoms of anaemia. • Preparation of questionnaire and learn the techniques.
10.	Assessment of food and nutrient availability of inmates of any hostel/ orphanage /old age home etc. using food inventory methods. • Preparation of questionnaire and learn the techniques. • Data collection on 1st day of week. • Data collection on 7th day of week. • Data interpretation and report writing.
11.	Assessment of food and nutrient intake using 24 hours dietary recall methods • Preparation of questionnaire and learn the technique. • Standardization of recipes , using standardized cups , spoons , glasses, preparation of cut outs

	• Data collection, conversion of cooked foods into raw ingredients and food and nutrient calculation, using Diet Cal Software and report writing.
12.	Assessment of food consumption pattern using diet history method. • Preparation of questionnaire, learn the technique. • Data collection, interpretation of results and report writing.
13.	Assessment of diet and nutrient intake using qualitative as well as quantitative food frequency questionnaire.
14.	Visit to malnutrition treatment centres in hospital – Observation of clinical symptoms of PEM and other symptoms of SAM child.
15.	Planning and preparation of diets of in-patient admissions of severe acute malnutrition in children
16.	Case study of case suffering from SAM(2)/Anemia/Vitamin A deficiency.
17.	Design a research to study prevalence of major nutritional problems among pre-school children.

References:

1. Vir SC. Public Health Nutrition in Developing Countries Pt 1 and 2 . Published by Wood head publishing India PVT LTD, New Delhi. Cambridge, Oxford, Philadelphea.
2. Sehgal S and Raghuvanshi Rita S Textbook of Community Nutrition, Indian Council of Agricultural Research, Published by: Directorate of Information and Publication of Agricuture, Indian Council of Agriculture Reserach, KrishiAnusandhanBhavan, Pusa, New Delhi-110012
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4. Robinson CH and Lawler MR. Normal and Therapeutic Nutrition, Macmillon, NewYork, 1996.
5. Waterlow JC. Protein Energy Malnutrition, Edward Arnold, A division of Hodder and Stoughton, 1992.
6. Sachdeva HPS and Chaudhary P (Eds). Nutrition in Children: Developing country concerns, Department of Pediatrics, Maulana Azad Medical College, New Delhi, 1994.
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8. Passmore R and Eastwood MR. Human Nutrition and Dietetics, ELBS, Churchill Livingstone, London, Baltimore, 1986.
9. De Mayer EM. Preventing and Controlling iron deficiency anaemia through Primary Health Care, WHO, 1989.
10. Jeliffe DS. The Assessment of Nutritional status of the community, WHO Geneva, 1966.
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14. Beaton GH and Bengoa JM. Nutrition in preventive Medicine. The major deficiency syndrome Epidemiology and approaches to control, World Health Organization, Geneva, 1976.
15. Talwar GP. Textbook of Biochemistry and Human Biology, Prentice Hall of India Pvt. Ltd., New Delhi, 1980.

STATISTICS (THEORY)

Paper code: FHN B01
Credits : 4
Max. Marks:100
Teaching Hours :4 Hours/Week
Total Teaching Workload :60 Hours/Semester

Objectives:

1. To understand the basic concepts of statistics.
2. To enable the students to understand various types of statistical tools and their interpretation

Contents:

UNIT –I

1.	Meaning and scope of Statistics and its importance in research
2.	Classification and tabulation.
3.	Measures of central tendency and dispersion (Mean Median, Mode, Quartiles, Range and Standard Deviation).
4.	Graphic and diagrammatic representation of data (Frequency, Histogram, Graphs, Bar-diagram and Pie charts).

UNIT –II

5.	Elementary ideas on probability (Simple Probability) skewness and kurtosis definition. Elementary ideas of random variable and its density function (Binomial, Poison, Uniform, Normal varieties, Normal distribution and its properties, Use of Normal probability tables).
6.	Elements of testing a statistical hypothesis- formulation of the problem, Definition of typeI and II
7.	errors. Level of Significance, t-test, Z-test. Design of Experiment: Analysis of Variance

UNIT –III

8.	Correlation and Regression: Correlation and its interpretation. Product moment and Rank order. Correlation Coefficient Regression Equations (without derivation)and its interpretations, use of prediction.
9.	Non-parametric Inference: Sign, Mann Whitney and Chi square test (as goodness of fit and independence of attributes in 2*2 and r*c contingency tables).
10.	Use of computer for statistical analysis using SPSS.

References:

1. Simpson G,Kafka F. Basic statistics: a textbook for the first course, Oxford and IBH Publishers, New Delhi, 1977.
2. Taro Y. Sampling Theory, Prentice-Hall Publishers, New Delhi,1967.
3. Snedecor and Cocharan. Statistics Methods, Oxford and I.B.H. Publishers, Calcutta, 1968.
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6. Kerlinger FA. Foundation of Behavioural Research, Century Craft, New York, 1966.
7. Devdas RP and Kulandaivel. Handbook of Research Methodology, Sri Ram Krishna mission Vidhyalaya, 1971.

8. Good CV and Carter DE. Methods of Research- Educational, Psychological, Sociological Application, Century Craft, New York, 1954.

FOOD PROCESSING (THEORY)

Paper Code : FHN B02
Credits: 4
Max. Marks:100
Teaching Hours :4 Hours/Weeks
Total Teaching Workload :60 Hours/Semester

Objectives :

1. To impart systematic knowledge of basic and applied aspects in food processing and technology
2. To enable the students to understand food composition and its physico- chemical, nutritional and sensory aspects.
3. To gain in depth knowledge about processing and preservation techniques of cereals, pulses, oilseeds, meat and their products
4. To optimise process parameter for consistent quality processed food products

Contents:

UNIT-I

1. Brief introduction of Cereals and legumes
2. Milling process: Complete milling process, types of milling processes: break rolls, reduction rolls, milled products and their nutritive values and applications.
   Baking technology: bread, biscuits /cookies and cake, principles of baking, Ingredients and their functions, methods of preparation, in process control, faults, causes and remedies, methods of leavening: physical, biological and chemical, scoring of quality parameters.
3. Breakfast cereals: wheat, oat, rice and corn.
4. Legume technology: general composition and processing : decortications, germination, Fermentation,
5. agglomeration and effect of cooking.
6. Soyabean: defatted flour, milk and isolated protein

UNIT II

7. Dairy and Flesh Food Technology
8. Milk: composition, factors affecting milk quality, physical and chemical properties and its processing: clarification, Separation, centrifugal process, natural creaming, pasteurization, sterilization, homogenization, effect of processing on nutritive value.
   Milk Products: milk powder, Khoa, Cottage cheese, butter, butter oil, margarine, cheese, ice cream-commercial processing, BIS Standards, Packaging and distribution.
9. Meat:slaughtering and related practices, pre slaughter handling, grading, ageing, curing, smoking and tenderizing of meat, meat pigments and color changes, cooking, storage, methods of preservation for value addition and spoilage. Sausages and table ready meat products.
10. Poultry: Production consideration, processing plant operation (slaughter and bleeding, scalding, de-feathering, eviscerating, chilling and packaging), cooking, tenderness, flavor and color changes.
11. Eggs: Structure, quality factors, storage, bacterial infection and pasteurization, freezing, drying and egg substitutes.

12.	Fish: Types of fishes, onboard handling and preservation, drying and dehydration, salt curing, smoking, marinades, fermented products, canning, Modified Atmosphere Packaging and quality factors.
13.	Oilseeds, Fruits and Vegetable technology
14.	Production and processing methods of fats and oils, hydrogenation Fat and oil Products: Margarine shortenings and frying oils, Mayonnaise and salad dressings, fat substitutes.
15.	Ripening of fruits and Food spoilage
16.	Principles of fruits and vegetables preservation. Processing technologies: Freezing, dehydration/drying, blanching, canning, preserves: jam, jelly, marmalade, pickle, sauce, squash, syrup, chutney.
17.	Processing and preservation for small scale industry with special reference of FPO 1955.

References:

1. Herausgegeben VG, Fabriani C, Lintas S and Zahlr AT. Durum Wheat: Chemistry and Technology, American Association of Cereal Chemists, Inc., St. Paul, Minnesota, USA, Vol 32, Issue 2, 1989.
2. Kent NL. Technology of Cereals.Pergamon Press, IV ed.Oxford, United Kingdom, , 1993.
3. Stadelman WJ, Olson VM. Shemwell GA and Pasch A. Egg and Poultry -Meat Processing, I ed.VCH Publication, New York, , 1998.
4. Winton KB and Winton AI. Techniques of Food Analysis. IV ed.Agrobios, Jodhpur, Rajasthan, 2006.
5. Samuel MA. Bakery Technology and Engineering. III ed., Pan-Tech International publishers,., 1999.
6. Pomeranz Y and Meloan CE. Food Analysis: Theory and Practice. III ed.,Springer Publishers, New York, , 2002.
7. Potter NN and Hotchkiss JH. Food Science. V ed.CBS Publishers and distributors, New Delhi, 2007.
8. Siddapa GS. Preservation of Fruits and Vegetables, ICAR Publication, New Delhi, 1986.
9. Van LoeseckeHW. Outlines of Food Technology. VI ed.,Agrobios, Jodhpur, Rajasthan, ,2002.
10. Salikhe DK, Kadam SS. Handbook of Fruit Science and Technology. V ed., Production Composition, Storage and Processing. Marcel Decker Inc, New York, 1995.
11. Subbulakshmi G and Udipi SA. Food Processing and Preservation. I ed., New age International Publishers, New Delhi, 2001.
12. Marriott NG, Gravani RB. Principles of Food Sanitation. V ed., Springer Publication, New York, 2006.
13. Kumar DS. Outlines of Dairy: Technology. I ed., Oxford University Press, USA, 2001

NUTRITIONAL BIOCHEMISTRY – II (PRACTICAL)

Paper Code : FHN B11
Credits: 4
Max. Marks : 100
Teaching Hours : 2 Practicals / Week(3 Hours/Practical)
Total Teaching Load : 30 Practicals /Semester

Objectives:

1. To demonstrate the need for careful planning and organization of laboratory work and skilful execution of practical/experiments.
2. To develop an understanding of the principles of various biochemical techniques.
3. To develop competence in biochemical estimations.
4. To apply the knowledge acquired from the biochemical estimation to human nutrition.

Contents:

1.	Titrimetric estimation: Determination of calcium in milk powder , $CaCo_3$ solution.
2.	Colorimetric estimation (in unknown solution) • Determination of Iron in Ferrous Ammonium sulphate solution and in blood. • Determination of Haemoglobin in blood by colorimetric method. • Determination of phosphorus in milk and phosphorus solution by F.S. colorimetric method. • Determination of protein by Lowry/ Biuret method.
3.	Enzymes assays • Determination of Alkaline phosphatase Enzyme. • Determination of Transaminase enzyme (GOT and GPT)
4.	Paper Chromatographic separation of Amino Acids by • Circular method • Ascending and • Descending methods

FOOD MICROBIOLOGY (PRACTICAL)

Paper code: FHN B12
Credits : 4
Max. Mark :100
Teaching Hours : 2 Practicals/Week (3Hours/Practical)
Total Teaching Workload: 30 Practicals/Semester

Objectives :

1. To understand the functioning of a microscope.
2. To understand the technique of culturing and staining strategies.
3. To learn about the microbiology of foods.

Contents :

1.	Principles, use and maintenance of microscope.
2.	Functioning and use of various microbiology laboratory equipments.
3.	i)Preparation of Culture media : • Preparation of General Purpose Media • Preparation of Selective and Differential Medium ii)Techniques of Culturing : • Sub-culturing of a given culture iii)Pure Culture Techniques :

	• Isolation of Pure Culture of Bacteria by Streak Plate Method
4.	Quantitative Techniques : • Estimation of Amount of Bacteria by Pour Plate Method • Quantitative Determination of Viable Microbes
5.	Colony characteristics and staining techniques : • Preparation of culture media in the Laboratory and streaking Observation of colony characteristics.
6.	Staining Strategies in the Laboratory : • Preparation of bacterial smear • Simple Staining of Bacterial Culture • Gram Staining of Bacterial Culture • Determination of the quality of milk sample by methylene blue reduction test
7.	Microbiological Analysis of Food Samples: ice cream, butter, cheese, curd, fruits, juices etc: • Observation and Recording for these Exercises
8.	Sampling and Analysis of Microbial Load on Food Contact Surfaces : • Assessing Sanitary Quality of Contact Surface by Swabbing Method • Analysis of Air of Processing Facility for Microbial Load
9.	Field visit to concerned food plants to food safety and HACCP practices.
10.	Field visit to any two food vendors to assess the food safety norms being followed.

FOOD PROCESSING (PRACTICAL)

Paper Code: FHN B13
Credits: 4
Max. Marks: 100
Teaching Hours : 2 Practicals/Week (3 Hours/Practical)
Total Teaching Load: 15Practicals/Semester

Objectives :

1. To understand the raw materials analysis and their processing technology used in different products development.
2. To understand the processing technologies of different products and concept of product optimization
3. To impart systematic knowledge of basic and applied aspects in food processing and technology
4. To enable the student to understand food composition and its physico chemical, nutritional and sensory aspects.

5. To gain indepth knowledge about processing and preservation techniques of milk products technology and fruits and vegetables technology.

Contents:

1. Cereal and Cereal Products Technology

(A) Bread baking

a) Quality testing of different flour:

- Gluten quality and quantity
- Moisture and ash percent
- Water Absorption Power (WAP)
- Pekar color test
- Maltose value
- Falling Number
- Dough Raising Capacity

b) Bread Processing: process optimization of

- Straight dough method
- Sponge and dough method (delayed salt method)
- Potassium bromate response of different flours
- Optimization of brown bread process
- Preparation of sweet buns
- Preparation of pizza base

(B) Biscuits and cakes

- Preparation of short and hard dough biscuits and packaging and shelf life studies for 5 weeks
- Preparation of sponge and cream cakes packaging and shelf life studies for 5 weeks

2. Visit to milk processing industry

3. Milk and milk products technology

- Chemical analysis of milk and determination of its components like fat, SNF, protein, TSS
- Detection of preservatives in milk (boric acid and borate)
- Detection of adulterants in milk and analysis of cheese, paneer, khoa as per BIS standards
- Tests to judge the efficiency of pasteurization and homogenization

4. Fruits and Vegetable Technology

- Analysis of Proximate principles: Carbohydrate, sugars, ash, moisture, fat and protein.
- Experiment on control of enzyme activity, enzyme inactivation in fruits and vegetables
- Preservation of fruits and vegetables using heat, salt and sugar and estimation of effect of processing on nutrients and color:
- Processing of tomato products

	• Processing of jams, jellies and marmalades • Processing of pickles and brines • Estimation of acidity, total solids of different foods - Squashes, syrups and juice. • Dehydration of fruits, and vegetables and shelf life studies: its effect on color, texture and flavor. Rehydration ratio, rehydration coefficient • Preservation of fruits and vegetables using low temperature
5.	Fat and oil technology • Fat absorbance, • Degree of unsaturation • Peroxide value • Acid value • Saponification value