**M.Sc. NUTRITION AND FOOD TECHNOLOGY**

(UNDER NON-SEMESTER PATTERN)

(This will come into effect from the academic year 2013 – 14)

**NAME OF THE COURSE** : M.Sc. (NUTRITION & FOOD TECHNOLOGY)

**DURATION OF THE COURSE** : TWO YEARS

**ELIGIBILITY FOR ADMISSION**

Graduation in any branch of Home Science, Microbiology, Bio-Chemistry, Bio-Technology and any other degree with chemistry as major or ancillary subject.

**COURSE CONTENT & SCHEME OF EXAMINATION**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>PAPERS</th>
<th>Max. Marks</th>
<th>Duration of Exam</th>
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<tr>
<td></td>
<td><strong>FIRST YEAR</strong></td>
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<tr>
<td>1.</td>
<td>Advanced Nutrition</td>
<td>100</td>
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<td>2.</td>
<td>Advanced Food Science &amp; Chemistry</td>
<td>100</td>
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<td>3.</td>
<td>Food Safety &amp; Quality Control</td>
<td>100</td>
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<td>4.</td>
<td>Food Technology - I</td>
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<td>5.</td>
<td>Analytical Instrumentation</td>
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<td><strong>SECOND YEAR</strong></td>
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<td>1.</td>
<td>Research Methodology &amp; Biostatistics</td>
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</table>
2. Food Product Development and Marketing 100 3

3. Food Technology – II 100 3

4. Food Analysis Practical 100 3

5. Food Processing 100 3

Grand Total (I + II Year) 1000

PATTERN OF THEORY QUESTION PAPER
Max. Marks: 100 Time: 3 hours

PART – A (5x5 = 25 Marks)
Atleast two questions from each unit.
Answer any five questions out of seven questions.

PART – B (5 x 15 = 75 Marks)
Atleast one question from each unit.
Answer any five questions out of seven questions.

DECLARATION OF RESULT
Passing Minimum - 50 marks out of 100

Class will be awarded as below.
50 – 59 - II Class
60 & Above - I Class
75 % Above - Distinction

ADVANCED NUTRITION
Objectives
Develop approaches to identify food safety hazards in Food processing
- Apply preventive measures and control methods to minimize microbiological hazards and maintain quality of foods

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Develop quality control strategies.

Unit – I

- **Energy**: Definition, units of energy, Energy content of foods. Physiological fuel value, Measurement of energy expenditure, BMR, Thermic effect of food, SDA, Methods of measurement, Factorial methods of estimating energy requirement of individuals, Regulation of energy metabolism.

- **Carbohydrates**: Types, Classification, functions, absorption, metabolism, digestion and transport. Dietary fibre- Classification and its role. Glycemic index of foods. Sweeteners-nutritive and non-nutritive.

Unit – II

- **Proteins**: Classification, digestion, absorption and transport. Protein quality, methods of evaluating protein quality. Protein requirements.

- **Lipids**: Classification, digestion, absorption and transport. Functions of fat and EFA. Role of n-3, n-6 fatty acids in health and disease. Requirements of total fats.

Unit – III

**Minerals**: Functions, metabolism, deficiency and toxicity and food sources of:
- Macro minerals: Calcium, Phosphorous, Magnesium, Sodium and Potassium.

Unit – IV

**Vitamins**: Nomenclature, Food sources, functions, metabolism, deficiency and toxicity of:
- Fat soluble: Vitamin A, D, E and K.
- Water soluble: Thiamine, Riboflavin, Niacin, Pyridoxine, Folic acid, Cyanocobalamin and Vitamin C.

Unit – V

- **Water**: Functions, sources, composition of intra and extracellular fluids. Water balance and its regulation, Acid – base balance, Deficiency and Excess or water.

References

ADVANCED FOOD SCIENCE AND CHEMISTRY

Objectives
● Gain knowledge on the nutritive value of different foods to understand the concepts in food
● Develop skills to prepare acceptable foods with regard to appearance, palatability and nutritive value

Unit – I
● Properties of Foods: Physico-Chemical properties of foods – Organic food components, colloids, osmotic pressure, food dispersions (sols, gels, emulsion, foam), Hydrogen ion concentration.

Unit – II
● Starch–Hydrocolloids and gums: Functions in food systems, properties, gelatinization, retrogradation and modified starches.

Unit – III
● Proteins: Functional properties of proteins, modified proteins, denaturation of proteins and maillard browning.
● Lipids: Physical and chemical properties, Rancidity of fats, uses of fat replacers

Unit – IV
● Natural food flavours – Flavours in food and their industrial application.
● Water- Role of water in foods, free water and bound water, functional properties, water activity.
● Enzymes -Importance of Enzymes in food processing – Amylases, Proteases, Lipases, Oxidoreductases, hydrolases.

Unit – V
● Food additives: Definition, Types, Role in food industry.
● Leavening agents: Definition, Classifications and its role in food processing.
● Colour of foods: Natural colours, certified artificial colours, Non-certified colors.

References
1. Food chemistry by H.D.Belitz.,
2. Food Additives – R.J.Taylor
3. Enzymes in food processing by G.G. Birch, N.Blakebrough & K.J.Parker
5. Food science, chemistry and experimental foods by M.Swaminathan.
6. Food Science by Sri Lakshmi.B.
FOOD SAFETY AND QUALITY CONTROL

Objectives
To enable the students
  1. To standardize food products through sensory evaluation.
  2. To understand the fundamental food quality control procedures.
  3. To know about Food standards and Laws

Unit – I
Introduction to sensory evaluation: Sensory quality parameters-size and shape, texture, aroma, taste, colour and gloss. Types of sensory tests: subjective & objective test.

Unit – II
Selection of sensory panelists, general testing conditions - factors influencing sensory measurements; designing of questionnaire and/or evaluation of scorecard; consumer acceptability using sensory evaluation.

Unit – III
Food Adulteration – Definition, classification of adulterants, List of foods commonly adulterated, harmful effects of adulterants and methods of detecting adulterants.

Unit – IV

Unit – V

References


**FOOD TECHNOLOGY – I**

***Objectives***

**To enable students**

1. To know the principles and methods involved in the processing of Agricultural and Horticultural foods

2. To develop skills in the preparation of Agricultural and Horticultural food products.

**Unit – I**

- **Rice**: Classification, physicochemical characteristics; Drying, rice milling technology; by-products of rice milling and their utilization; Parboiling of rice- technology and effect on quality characteristics.

- **Wheat**: Types and physicochemical characteristics; wheat milling, products and their byproducts;

- **Minor Millets**: Corn - Types and nutritive value; dry and wet milling process, processing of barley, oats and sorghum.

**Unit – II**

- **Physiochemical Characteristics**: processing and storage; Extraction of edible oils - Mechanical and solvent extraction, byproducts of oil extraction, meal, flour, oil seeds, protein concentrates and isolates.
Unit – III
- **Fresh fruits and vegetables:** Handling, grading, cleaning, pretreatments, transportation, pre cooling, chilling, packaging and transportation.
- **Freezing of Fruits and Vegetables:** Different freezing methods and equipments, problems associated with specific fruits and vegetables;
- **Dehydration of Fruits and Vegetables:** Different methods and its effect on quality.

Unit – IV
- **Fruit and vegetable Processing:** Juices, Squashes, Syrups, RTS, Jam, Jellies, Preserves, Candies, Pickles, Sauces and Ketchup.

Unit – V
- **Spices:** Pepper, onion, ginger, cardamom and garlic processing, physiochemical Characteristics processing of extraction of essential oils.

References
ANALYTICAL INSTRUMENTATION

Objectives

To enable the students to
Understand the principle, instrumentation and applications in Foods and Nutrition.

Unit – I

- **Chromatography:** Meaning – Types of Chromatography – Principles, Components and Applications of (i) Paper Chromatography – Ascending and Descending – One dimensional and two dimensional (ii) Thin Layer Chromatography – (iii) Gas Chromatography (iv) Ion Exchange (v) Gel Filtration (vi) High Performance Liquid Chromatography.

Unit – II

- **Electrophoresis:** Meaning – Types – Paper, Starch, Gel, Agar-gel, Polyacrylamide gel, Moving boundary Electrophoresis, Immuno electrophoresis – Principles - Components – Applications.

Unit – III

- **Colorimetry, Fluorimetry:** Photoelectric Colorimeters, Fluorimetry – Principle, Applications.
- **Centrifugation:** Types of Centrifuge – Ordinary and Ultracentrifuge – Principle and Applications.
- **Microbiological Assays:** Types of Assays – Principle – Requirements for the conduct of Microbiological Assays – Applications.

Unit – IV

- **Spectroscopy:** Spectrophotometer types– Principle, Applications of Atomic Absorption Spectrophotometer and UV Spectrophotometer.
- **NMR and NIR**
  Nuclear Magnetic Resonance – Application and Principle
  Near Infrared – Principle and Application

Unit – V

- **Isotopes:** Types – Stable and Radioactive, Units of radioactivity – Uses in biological investigation – Geiger Muller Counter and Scintillation Counter – Effects of ionizing radiation – hazards and prevention – Applications.
- **pH and Buffer:** pH meter – measurement of pH, Buffer – Definition – Types – Buffer system with special reference to living body.
References

RESEARCH METHODOLOGY AND STATISTICS

Objectives
To enable the students
To enrich the knowledge in research and to design research.

Unit – I
Meaning of research, role of statistics & research in Nutrition & Food technology discipline, objectives of research, types of research and their application, selection and formulation of research problem

Hypothesis, designing research-different types- Completely randomized design, Randomized block design, Latin square design, Factorial design, and Trend analysis

Sampling methods-random sampling methods and non-random sampling methods, size of sample, sampling and non-sampling errors

Unit – II
Techniques of data collection. Methods of collecting primary data interview method, case-study method, scaling methods, case study, home visits, experimentation method.

Unit – III
Representation of data-diagrammatic and graphic representation-significance of diagrams and graphs, general rules for constructing diagrams, types of diagrams, graphs of frequency distribution

Unit – IV
Measures of central tendency-mean, median, mode their relative advantages and disadvantages, measures of dispersion-mean deviation, standard deviation, quartile deviation, coefficient of variation, correlation, coefficient of correlation, rank, correlation regression equations and prediction
Unit – V

Probability-rules of probability and its application distribution-normal, binomial, their properties, importance of these distributions in statistical studies. Tests of significance, large and small samples, "t" and f test, chi-square test, analysis of variance one-way and two way classification. Testing of hypothesis. Levels of significance.

References:

FOOD PRODUCT DEVELOPMENT AND MARKETING

Objectives
- To enable the students :
- To know the different concepts of product development and formulation.
- To know the market trends, market testing methods, launching and commercialization

Unit – I
New food product - Definition – Concept and general characteristics of new food product - Classes of New Food products, Need for Product development, Factors affecting food product development, causes of product failure/ success.

Unit – II
Phases in Food Product Development- Company objectives - Perceived needs of Market - Ideas - Screening - Feasibility studies - Consumer research - Financial review Development - Production - Consumer trials - Test market.

Unit – III
Difference between market and market places; Customers and Consumers; Marketing Characteristics of the product, Product Life cycle. Generation of Food product Ideas - Sources of new product ideas - The market –places, types of market places - Within the company - Outside the market place.
Unit – IV
Organizing for new product development - Concepts of research and development
Creativity. Criteria of screening - general criteria for screening - Constraints - financial
and technical constraints. Standardization of product formulation and product design;
Adaptable suitable technology role of Engineering in the development process.

Unit – V
Process design, Scale - up and in - process specifications, Manufacturing plant and
Technical aspects and-production trials. Market testing - methods of testing – Evaluation
Quality assessment of new developed products. Costing/pricing and economic evaluation
of the product . Product launch and commercialization of the product.

References:
1. Brody Aaron. L, Lord and John B, Developing new food products for a changing
2. Gordon W. Fuller. New Food Product Development – From concept to market place,
4. Graf and Saguy, Food product development (From concept to Market Place). CBS
   Publishers, New Delhi.
   Division, Agriculture, Canada.

FOOD TECHNOLOGY - II

Objectives

To enable students

- To impart knowledge of basic and applied aspects of Milk, Meat, Poultry
  and fish processing and technology.
- To provide necessary knowledge of basic principles and procedures in the
  production of Milk, Meat, Poultry and fish products.
- To orient the students to potential use of various by-products of Meat and
  Poultry and fish.

Unit – I
Milk-Composition of milk of various species, quality evaluation and testing of milk,
procurement, transportation and processing of milk, cleaning & sanitization of dairy
equipments. Special milk flavoured, sterilized, recombined & reconstituted , toned &
double toned, Fermented milk products.
Unit – II
Fish – Biochemical composition and quality of fish and shellfish, Microbiological quality of fresh fish, Fresh fish handling and chilling, Preservation by curing-drying, salting and smoking, Freezing technology and canning preservation of fish, Fish by-products and waste utilization.

Unit – III

Unit – IV
Poultry - classification, composition, preservation methods and processing of poultry. Slaughtering of poultry, inspection and grading.

Unit – V

References
FOOD TECHNOLOGY PRACTICAL

1. Determination of gluten content in wheat flour.
2. Parboiling of rice.
3. Malting, puffing and popping of grains
4. Blanching and browning control of fruits and vegetables.
5. Preparation of Jam and Jellies.
6. Preparation of fruit preserves (Candies, Glassed candies and crystallized candies).
7. Preparation of pickles.
8. Dehydrated products --- vegetables dices tray drying, osmotic dehydration of seasonal fruit.
9. Tomato processing - Juice, sauces, ketchup and puree
10. Fruit pulping / juice / beverage preparation.
11. Preparation of special milks.
12. Preparation and evaluation of indigenous milk product such as khoa, channa, paneer, ghee, rasgulla, gulab jamun, shrikhand, lassi, burfi.
13. Slaughtering and dressing of meat animals; study of post-mortem changes; meat cutting and handling;
14. Preservation by dehydration, freezing, canning, curing, smoking and pickling of fish
15. Preparation of meat products- barbecued sausages, loaves, burger,
16. Evaluation of fish and other marine products preparation of fish fingers and others.
17. Preparation of partially hydrolysed and deodorized fish powder.(PHD)
18. Preparation of extruded fish products.
20. Evaluation of quality of eggs

FOOD ANALYSIS PRACTICAL

1. Estimation of Calorific value of food
2. Estimation of Moisture content
3. Estimation of Ash content
4. Estimation of Protein
5. Estimation of Fat
6. Estimation of Carbohydrate
7. Estimation of Calcium
8. Estimation of Phosphorus
9. Estimation of Iron
10. Estimation of Vitamin C
11. Estimation of Thiamine
12. Estimation of Riboflavin
13. Estimation of Vitamin A and carotene
14. Estimation of Antioxidants
15. Estimation of Iodine number
16. Estimation of Saponification number.