UNIVERSITY OF MUMBAI

No.UG/380 of 2008.
Mumbai 400 032,
13th August, 2008.

The Principal,
College of Home Science
Nirmala Niketan,
49, New Marine Lines,
MUMBAI-400 020.

Madam,

I am to inform you that the recommendation made by the Ad-hoc Board of Studies in Home Science at its meeting held on 7th June, 2008 has been accepted by the Academic Council at its meeting held on 13th June, 2008 vide item No.4.27 and subsequently approved by the Management Council at its meeting held on 27th June, 2008 vide item No.13 and that, in accordance therewith, the M.Sc.(Home Science) degree course in Food Processing and Preservation is introduced by the University from the academic year 2008-09.

Further that in exercise of the powers conferred upon the Management Council under Section 54(1) and 55(1) of the Maharashtra Universities Act, 1994 it has made Ordinances 5767 and 5768 and Regulations 5887, 5888, 5889 and 5890 including scheme of examinations and syllabi relating to the M.Sc.(Home Science) degree course in Food Processing and Preservation is as per Appendix and that the same has been brought into force with effect from the academic year 2008-2009.

Yours faithfully,

13/08

(D. H. KATE)
for REGISTRAR

MUMBAI-400 032
13th August, 2008

A.C/4.27/13.06.2008
M.C./13/27.06.2008

****

No.UG/380-A of 2008, MUMBAI-400 032 13th August, 2008.

Copy forwarded with compliments for information to :-

1) The Dean, Faculty of Science,
2) The Chairperson, Ad-hoc Board of Studies in Home Science,
3) The Controller of Examinations,
4) The Co-ordinator, University Computerization Center.

13/08

(D.H.KATE)
for REGISTR

Enclosure to Item No. 4·27
13.6.2008

UNIVERSITY OF MUMBAI

Ordinances, Regulations,
And Syllabus
for M.Sc. (Home Science) degree Course
in
Food Processing and Preservation

(Introduced With effect from the academic year 2008-2009)

PATTERN OF THEORY PAPER

1) For a 100 mark paper 25 marks will be internal 75 University exam for which
   a) Q.No.1 will be compulsory of 15 marks
   b) 6 more questions to be set of 15 marks each of which 4 to be attempted
   c) In all 5 questions of 15 marks to be answered, totaling to 75 marks
   d) Paper will be of 3 hours duration

2) For a 75 mark paper, 15 marks will be internal, 60 marks University exam for which
   a) Q.No.1 of 15 marks will be compulsory
   b) 5 more questions of 15 marks will be set of which 3 have to be attempted
   c) Totally 4 questions of 15 marks to be answered , totaling to 60 marks
   d) Paper will be of 2 hours duration

3) For 50 mark paper, 10 marks will be internal, 40 marks for University exam for which
   a) Q.No. 1 is compulsory of 10 marks
   b) 5 more questions of 10 marks each will be set of which 3 questions will be attempted.
   c) Totally 4 questions of 10 marks to be answered, totaling to 40 marks
   d) Paper will be of 1 ½ hours duration

O 2767 The Course

M.Sc. (HOME SCIENCE)

FOOD PROCESSING & PRESERVATION

O 5768 Eligibility :

B. Sc with Home Science (any branch)
B.Sc with Microbiology / Biochemistry/Life Sciences /Chemistry/Biotechnology/combinations
B.Sc with Agriculture
Candidates of either sex are eligible for the course.

Course Objectives:

1. To equip students with the knowledge of basic chemistry of food components, the chemical and biochemical reactions in foods.
2. To impart students a systematic approach to basic and applied aspects of food processing and technology.
3. To familiarize students with the various theoretical and practical aspects of food quality and its control.
4. To encourage students to work in conjunction with relevant food industry to get a deeper insight into the subjects of Food Science and Technology.
5. To provide students with an opportunity to conduct independent research.

R 5887 STUDENT INTAKE CAPACITY: 30

M.Sc. (Home Science)

R Title of the Course FOOD PROCESSING & PRESERVATION

R 5888 FEE STRUCTURE

S.NO.	HEAD	AMOUNT/STUDENT (Rs.)	
		M.Sc. I	M.Sc. II
1	TUITION FEES	25,000	25,000
2	LABORATORY FEES	4,500	5,000
3	LABORATORY DEPOSIT	500	--
4	LIBRARY FEES	2,000	2,500
5	LIBRARY DEPOSIT	500	----
6	GYMKHANA FEES	500	500
7	IDENTITY CARD	75	75
8	EXAMINATION FEES	1.000	1,000
9	MAGAZINE	100	100
10	PROSPECTUS (handbook, syllabus & application form)	700	---
11	PROJECT EVALUATION	---	1,000
12	CAUTION MONEY	500	500
13	UNIVERSITY REGISTRATION	825	---
14	UNIVERSITY SHARE OF TUITION FEES	800	800
15	FIELD VISITS*	1,000	1,000
	TOTAL	38,000	37,975

* Additional charges will be levied for outstation visits/ conferences

FOOD PROCESSING & PRESERVATION

R 5889

M.Sc (I) COURSE OUTLINE

Subject	Theory/ Practical	Internal Marks	University Exam Marks	Total marks	Periods Per week	University Exam hours	Internal /External
Food Science	Theory	15	60	75	3	2 ½	Both
Food Processing& Technology	Theory	25	75	100	4	3	Both
Food Microbiology	Theory	10	40	50	2	2	Both
Nutrition Through Life Cycle	Theory	10	40	50	2	2 ½	Both
Research Methods and Statistics	Theory	25	75	100	4	3	Both
Chemical Analysis of Foods	Practical	15	60	75	5	5	Both
Food Product Development	Practical	50	---	50	3	---	Internal
TOTAL				500	23		

FOOD PROCESSING & PRESERVATION

M.Sc (I)

MARKS:75
3 Periods /week

FOOD SCIENCE
(Theory)

OBJECTIVES

1. To provide basic information on composition, properties of food constituents.
2. To acquaint students with the important chemical and physical interactions between food constituents that affect functional properties, quality, safety and nutritive value of food.
3. To understand the chemical changes that take place during processing , storage and utilization of food.
4. To study the chemistry of food flavour, aroma and the type of food additives in accordance with current Food Industry and regulatory rules.
5. To equip students with basic entrepreneurial skills.

Course content:

UNIT I — No. of lectures(NOL)

A..Introduction to : 4

i) Food chemistry: composition of food, functional groups, isomers and Stereochemistry, Bonding, polarity and Solubility

ii)Food Science-Meaning & scope

.B Physical properties of Food Preparations, Energy transfer, state of matter dispersions emulsions, gels, foams. 2

C Chemistry of Water: Water content of Foods, Physical and chemical properties of water and ice, water activity and microbial growth. Role of water in food. 2

D. **Carbohydrates chemistry : Classification, structures and food sources** 10
chemical change of sugars in foods – Hydrolysis, Maillard reaction, crystallization changes in starch - pasting, gelatinzation, gelation, syneresis, retrogradation, dextrinization. Modified
and resistant starches Hydrolysate products of starch.
Gums: Functions, types, sources and uses.
Pectic substances:- Properties, gel formation Jams, jellies, marmalade.
Crystalline candies, syrups, sauces confectionary.

UNIT II 9

A. Lipids in Food : Classification, structure and functions of Lipids. Physical and chemical properties. Chemical constants Lipolysis, Peroxidation, Auto oxidation and, Hydrogenation of lipids.. Effect of storage on chemical constituents of fats. Fat as frying medium, emulsifiers shortening agents, whipping agents, tenderizers. Thermal decomposition of lipids & Rancidity in fats. Structured lipids and fat substitutes.

B i Proteins in foods:

Classification & Physico chemical properties of amino acids. Peptides, viz Glutathione, Carnosine, Anserine Proteins. Structure of proteins at four levels of organization. Bonds stabilizing protein structure , Collagen, gelatin. 4

ii.Proteins : Reactions & changes of proteins in food: Hydrolysis, denaturation, coagulation, protein gel formation. Development of gluten complex, gelatin gel, modified and derived proteins, texturised vegetable proteins, use of synthetic amino acids for food fortification 6

C: Classification, use of enzymes in food industry. Proteolytic immobilized, bound coenzymes Factors affecting enzyme activity. Microbial enzymes and genetically engineered enzymes. 5

UNIT III

A **Food Color:**

Theory of food colors, conjugation in molecules, natural food colors – heme pigments and plant pigments- chlorophyll, carotenoids anthocyanins, anthoxanthins, tannins, caramel. Artificial food colors. Measurement systems for food colors. Effect of processing, pH on food colours & pigments 9

B **Food Flavours.**

Food Flavours:-chemistry, flavour enhancement and olfaction. Relationship between odour and molecular structure eg musk, camphor, caramel, roasted almond.etc. Examples of food flavour principles in common foods – carbonyl, phenolic, esters, terpenes sulphur compounds 8

UNIT IV

Modern Technology in Food stability. 8

Freezing, lyophilization, hurdle technology, vacuum drying , radiation technology. Modified atmosphere packaging. Concept of minimally processed foods Application of Nanotechnology, Biotechnology and genetic engineering .

UNIT V

Product development – 8

Global and Indian scenario w.r.t. food product development.
consumption and dietary pattern of traditional and non-traditional foods.
Current market scenario and techniques of market survey. Development of Entrepreneurship skills, special schemes for women . Project planning ,investments and financing.

References:

Mcwilliams, M (2007) Foods: Experimental Perspectives 5th ed, New Jersey : Macmillan Publishing Co.

N.S. Manay and M. Shadarksharaswamy (1997) Foods : facts and principles New Age International Publishers, New Delhi.

Potter, N.N. and Hutchkiss J.H (1997) a Food Science 5th ed New Delhi: CBS Publishers and Distributors.

Subbulakshmi, G and Udipi, S.A. (2001) Foods processing and preservation New Delhi ; New Age International (P) Ltd. Publishing.
Swaminathan, M (1995) Food Science Chemistry and Experimental Food. The Bangalore Printing and Publishing Co. Ltd.
Rick Parker (2003) Introduction to food science N.Y Delmar Thomson learning.
Scottsmith and Hui Y.H (Editors) (2004) Food Processing – Principles and applications Blackwell Publishing, London.
Borvers, J. (1992) Food Theory and application (2nd ed) New York Maxwell MacMillan International edition.
Vacklavick V and Christian E (2003)
Essentials of Food Science
Kluwer Academic/ Plenum Publisher, New York
Belitz, H.D. and Grosch, W (1999) Food Chemistry, Berlin Springer
Latest journals in Food Science, Food Technology, Food Industry will be referred.

FOOD PROCESSING & PRESERVATION

M.Sc (I)

FOOD PROCESSING AND TECHNOLOGY

Marks: 100
(Theory)
4periods/week

Objectives

1. To impart a systematic knowledge of basic and applied aspects of food processing and technology.
2. To gain indepth knowledge about processing and preservation of techniques used for different food groups.
3. To emphasize the importance of food plant sanitation in various areas of processing.

Course Content: No. of Lectures : (NOL)

UNIT I

Cereal and cereal Product technology 10

i. Composition and commercial value of the following cereals.
Wheat, rice, maize, barley, oats, rye, ragi and bajra

ii. Processing technology of the following.
Yeast leavened breads
Muffins
Cakes
Biscuits
Break fast cereals
Pasta products

UNIT II

Pulses and legume technology 5

i. Elimination of toxic factors
ii. Extruded Soya products
iii. Fermented Soya products
iv. Soya milk and ground nut milk

UNIT III

Technology of oil seeds 10

i. Extraction
ii. Refining of oil
iii. Hydrogenation, plasticizing and tempering
iv. Blending of oils
v. Margarine, shortenings and spreads
vi. Confectionary fats, cocoa butter, cocoa powder
vii. Mayonnaise

UNIT IV

Milk Processing technology 10

i. Milk composition
ii. Factors affecting milk quality
iii. Physical and chemical properties
iv. Milk processing
   a. pasteurization
   b. Homogenization
   c. Sterilization
   d. Effect of processing on nutritive value

UNIT V. Milk Products 10

i. Milk powder
ii. Sweetened condensed milk
iii. Butter
iv. Cheese
v. Ice cream
vi. Shrikhand
vii. Yogurt
viii. Flavoured milk products
ix. Milk substitutes
x. Probiotic products
xi. Milk chocolate

UNIT VI Meat, Fish ,Poultry and Egg

A. Meat Processing 5

Bacon
Ham
Hot dogs
Balogna

B. Fish Processing 5

Fish Meal
Fish oil
Frozen fish
Canned fish
Dried and smoked fish

C. Poultry and Egg 5

Frozen Poultry
Poultry Nuggets
Poultry meat products
Egg products.

UNIT VII

Fruit and Vegetable technology 15

Frozen vegetables and fruits
Canned vegetables and fruits
Dried fruits and vegetables
Chutney, pickle and sauces
Jams, jellies and marmalades and fruit cheese
Tomato juice & orange juice processing-Puree, pastes and powders

UNIT VIII

A. Fermentation technology- Principle & techniques 3

B. Beverages 5

- Alcoholic Beverages
  Beer, Wine
- Non Alcoholic Beverages
- Coffee, Tea, & Carbonated beverages

C. Newer trends in beverages. 2

UNIT IX

A. Convenience foods-Snack food technology 4
B. Functional foods.& Nutraceuticals - incorporation in food products 4
C. Food fortification 2

UNIT X

Food packaging-Packages with special feature. 5
Newer trends in packaging technology

NOTE: FOOD INDUSTRY VISITS WILL BE ORGANISED FOR STUDENTS TO MAKE THEORY MEANINGFUL. STUDENTS WILL ALSO PARTICIPATE IN VARIOUS LOCAL & NATIONAL LEVEL SEMINARS AND CONFERENCES.

References:

1. "SBP Board of consultants and Engineers" (1998) SBP Handbook of oil seeds, oil, fats and derivatives. SBP House, 4.45 Roop Nagar. Delhi 110007
2. M.M. Chakraborty (2003). "Chemistry and Technology of oils and fats" Allied publishers Pvt. Limited
3. J. Scott Smith. Y.H. Hui (2004) "Food Processing Principles and Applications Black well Publishing
4. D.K. Salunkhe, S.S. Kadam (2005) "Handbook of Vegetable science and technology" Marcel dekker, INC First Indian Reprint .
5. Vikas Ahulluwalia (2007). "Food Processing" Paragon International Publishers. S, Ansari Road, Daryaganj, New Delhi 110002.
6. Peter Fellows and Ann Hampton (1992) "Small Scale Food Equipment Intermediate Technology Publications in association with CTA.
7. Kent N.L. (1993) technology of cereals 4th ed. Pergamon Press.
8. Potter N. Joseph H. Hotchkiss (1997) Food Science New Delhi CBS Publishers and Distributors.

9. Duffy, JL(1981) Snack food technology. Noyes Data corporation, Park Ridge, New Jersey, U.S.A.
10. Booth, GR., (1997) Snack Food, CBS Publishers and distributors, 4596/1A,11-Daryaganz, New Delhi
11. Mahadeviah, M. & Gowramma,RV (1996) Food Packaging Materials, Tata Mc Graw Hill Pub. Co., LTD, New Delhi
11. D'Cunnha, JF (1998), Modern food packaging, IIP, Mumbai

M.Sc I

FOOD MICROBIOLOGY

Marks: 50

(Theory)

Period per week: 2

Objectives:

1. To introduce students to the field of Microbiology of different foods.
2. To enable students to understand classification, morphology, reproduction, cultivation and microscopic examination of microorganisms.
3. To enable students to understand causes and prevention of microbial spoilage and contamination of different foods.

Course Content:

No. of lectures (NOL)

UNIT I — 10

a) Evolution of Microbiology.
b) Characterization, classification and identification of microorganisms.
c) Toxonomy, Role and significance of microorganisms in foods

UNIT II. — 10

Intrinsic and Extrinsic parameters of foods that affect microbial growth.

a) Intrinsic factors – pH, moisture content, oxidation – reduction potential (Eh), nutrient content, anti microbial constituents, biological structures.
b) Extrinsic factors – Temperature of storage, relative humidity of environment and presence and concentration of gases in the environment.

UNIT III — 15

Microbial flora, incidence and types of microbial spoilage in the following foods:-

a) Cereals, millets and their products.
b) Pulses, legumes and their products
c) Nuts and oils seeds and their products.
d) Vegetables and fruits and their products.
e) Meat, fish, poultry and eggs and their products.
f) Milk and milk products
g) Processed foods – Dehydrated, canned, frozen and fermented foods.

UNIT IV — 7

Food Borne Diseases - Infections and Poisonings – Causes, Sources and Prevention.

UNIT V — 8

a) Control of microorganisms by physical and chemical agents.
b) Enzymes from microorganisms and microorganisms as foods.

References:

Banwart G.J, (2002) Basic Food Microbiology 2nd Edition, Chapman and Hall Inc., New York
Vasanthakumari R (2007) Textbook of Microbiology BI Publications Pvt. Ltd. New Delhi.
Jay J.M. (1992) Modern Food Microbiology 5th edition CBS Publishers and Distributors, New Delhi.
Pelczar, M.J. Chan. C.S. and Krieg N.R. (1996) Microbiology 5th edition, tata McGraw – Hill Edition.
Adams, M.R. and Moss, M.O. (2005) Food Microbiology 1st edition, New Age International (P) Limited, Publishers, New Delhi.
Frazier W.C. Food Microbiology,(2000) 2nd edition Tata Mc Graw – Hill Publishing Company Ltd. New Delhi.

FOOD PROCESSING & PRESERVATION

M.Sc (I)

NUTRITION THROUGH LIFE CYCLE
(Theory)

Marks: 50
No. of Lectures/week: 2

Objectives:

- To understand the changes in Human body composition during different stages of life.
- To study the influence of Nutrition on man during the different stages of life cycle.
- To be aware of, and update the knowledge in the field of nutrition as applied during the life cycle.

Course content:- No. of lectures (NOL)

UNIT I

A.) Basics of Nutrition – A brief overview of functions, sources & deficiency of Macro and Micronutrients 5

B) Balanced Diet 2

UNIT II A 15

Nutrition during Pregnancy

i) Reproductive Physiology (Male and Female) in brief.
ii) Nutrition related disruptions in fertility (under and over nutrition)
iii) Physiology of pregnancy
iv) Effect of Nutritional Status on pregnancy outcome.
v) Nutritional requirements and dietary guidelines
vi) Nutrition related complications
vii) Complications of pregnancy
viii) HIV/AIDS during pregnancy – Dietary concerns
ix) Role of Exercise & Fitness
x) Adolescence Pregnancy

UNIT II B 11

Nutrition during Lactation

i) Physiology of Lactation
ii) Human milk composition
iii) Nutritional requirements & dietary guidelines
iv) Benefits of Breast Feeding
v) Galactogouges
vi) Lactation Management in Normal & Special conditions

UNIT III

A) **Nutrition in infancy** 6

Physiological development, Motor, Cognitive development.

- Energy and nutrient needs.
- Feeding in early and late infancy
- Development of infant feeding skills
- Common nutrition problems
- Feeding Preterm and low birth weight infants.

B) Nutrition in Toddlerhood and Preschool, Childhood & Preadolescent. 8

- Growth and development
- Nutritional requirements
- Nutrition for children with special health care needs
- Feeding problems
- Nutritional concerns and prevention of nutrition related disorders
  a. Obesity – underweight
  b. Deficiency condition.
  c. Allergies, eating disorders.

C) Nutrition in Adolescence 10

- Growth and development
- Physiological and Psychological changes
- Nutritional requirements of adolescents
- Health and eating related behaviour.
- Situation with special needs
  a. Pregnancy
  b. Eating disorders
  c. Obesity – underweight
  d. Substance abuse
  e. Deficiency conditions
  f. Sports and athletics

UNIT IV

Nutrition in the Adult years. 8

- Physiological and Psychosocial changes
- Common nutritional concerns
- Defensive Nutrition paradigm
- Nutritional requirements and dietary recommendation.
- Physical Activity in adulthood.

UNIT V

Nutrition in Aging/Elderly. 10

- Theories of Aging, Physiological and Psychosocial changes
- The Aging Process
- Nutritional requirements of the Elderly
- Nutrition care

Nutrition needs during illness and chronic conditions.

Sensory loss

FOOD PROCESSING & PRESERVATION

M.Sc (I)

RESEARCH METHODS AND STATISTICS (Theory)

Marks: 100

Periods /week:-4

Objectives:

1. To help students develop the skills needed in conducting a research in their specialization.
2. To promote academic, research and professional ethics in students.
3. To introduce students to principles of good scientific writing.
4. To enable in students the skills in selecting, computing, interpreting and reporting statistics.

Course Content:

No.of lectures: (NOL)

Research Methods

Unit 1A: Introduction and overview (2)

(a) What is a research?

(b) Objectivity and subjectivity in scientific inquiry.

Unit 1B: Steps in the research process (7)

(a) Identifying broad areas of research in a discipline

(b) Identifying interest areas; using multiple search strategies

(c) Prioritising topics; specifying a topic; feasibility

(d) Review of literature/scholarly argument in support of study

(e) Specifying research objectives/hypotheses/questions

Unit 1C : Qualitative VS Quantitative Research (1)

Unit 2A:. Variables (5)

(a) Definition

(b) Characteristics

(c) Types

(d) Levels of measurement

Unit 2B: Validity and reliability in quantitative research (3)

Unit 3A: Research designs in quantitative research (6)

Distinguishing between the following research designs; and, selecting research designs that are congruent with one's research purpose.

(a) Longitudinal and cross-sectional

(b) Experimental, quasi-experimental and correlational

(c) Exploratory, descriptive, and explanatory

Unit 3B: Sampling techniques in quantitative research (6)

(a) Probability and nonprobability sampling methods

(b) Sampling methods in current use/examples from current research

(c) Issues with regard to sampling techniques

Unit 4A: Data entry in quantitative research (4)

(a) Contrasting paper-and-pencil (master sheet and codebook) vs. computer-based/technology-aided data entry (data file and dictionary information on variables)
(b) Creating data files and data management

Unit 4B: Qualitative research methods (6)

(a) Research designs in qualitative research
(b) Sampling techniques in qualitative research
(c) Data collection methods in qualitative research
(d) Data analytic strategies in qualitative research
(e) Reporting of results in qualitative research

Unit 5A: Ethics (5)

(a) In research in general
(b) In research with human subjects
(c) In research with animal subjects

Unit 5B: Scientific writing (7)

(a) Distinguishing scientific writing from popular and literary writing styles
(b) Characteristics/principles of scientific writing (avoiding plagiarism; use of citations, quotations, a reference list or a bibliography; writing from an outline, sectioning the document/using headings and subheading; avoiding redundancy; avoiding ambiguity; avoiding jargon)
(c) Writing a research proposal
(d) Reporting statistical findings in text

<u>Statistics</u>

Unit 6A: Introduction and overview (2)

Unit 6B: Descriptive Statistics for summarizing nominal level variables (3)

(a) Frequency (also known as a count)
(b) Raw frequencies vs. relative frequencies
(b) Percentages (how, when, and why)
(c) Barcharts and piecharts

Unit 7: (a) Descriptive Statistics for summarizing ratio level variables (10)
(b) Frequencies and percentages
(c) Computing an average/measure of a central tendency
Mean, Median, Mode(s), Contrasting the mean vs. median
Computing an average when there are outliers or extreme values in the data set
Robust measures of the center (5% trimmed mean; M estimators)
Quartiles and percentiles
(d) Computing a measure of variability or dispersion
Variance and standard deviation
(e) Discrete and continuous variables
(f) Histograms and line graphs

Unit 7B: Descriptive Statistics for summarizing interval level variables (1)

Unit 7C: Descriptive Statistics for summarizing ordinal level variables (1)

(a) Frequency and relative frequency per ascending category
(b) Mean and median with decoding
(c) Barcharts with bars with ascending categories on the x axis

Unit 8A: Probability: Foundation of Advanced/Inferential Statistics (6)

(a) Definition
(b) Role of probability in research and statistics
(c) Elementary concepts in probability

Unit 8B: Other concepts needed for the use of advanced/inferential statistics (6)

(a) Types of distribution, Frequency distribution, Normal distribution
Probability distribution, Sampling distribution
(b) Type I and type II errors
(c) Central limit theorem
(d) Point estimation vs. interval estimation
(e) Standard error (and confidence intervals)
(f) Parametric and nonparametric methods

Unit 9: Using an advanced statistical method (12)

(a) Steps in the use of an advanced statistical method
(b) Selecting and justifying the use of a test procedure
© Contrasting the observed value with the critical value and declaring test results
Level of significance (p values), Meaning, Cut-offs (in various disciplines)
Interpreting and reporting significance, Nonsignificant vs. insignificant
(d) Describing the results
(e) Discussing the results
(f) To study statistics that allows us to contrast phenomena
Univariate chi-square test, Bivariate chi-square test, t- or z- test for contrasting two independent groups, Paired t-test
(g) To study statistics that allows us to examine relationships between variables
Bivariate chi-square test
Product-moment correlation coefficient

Unit 10A: Ethics in the use of statistics (2)

Unit 10B: Demonstration of computer software such as the Statistical Package for the Social Sciences (SPSS) – Data entry, Data Management and Descriptive Statistics (5)

References:

Bhattacharyya, G.K., & Johnson, R. A. (1977). *Statistical concepts and methods.* NY: John Wiley.

Dwiwedi, R. S. (1997). *Research methods in behavioral sciences.* Delhi: Macmillan India.

Gravetter, F. J., & Waillnau, L. B. (2000). *Statistics for the behavioral sciences.* Belmont, CA: Wadsworth/Thomson Learning.

Kerlinger, F. N., & Lee, H. B. (200). *Foundations of behavioral research.* Orlando, Florida: Harcourt.

Leong, F.T.L., & Austin, J. T. (Eds.) *The psychology research handbook.* New Delhi: Sage.

FOOD PROCESSING & PRESERVATION

M.Sc I

CHEMICAL ANALYSIS OF FOODS

(PRACTICAL)

Marks: 75

Periods: 5 hours/ Week

Objectives:

1. To impart required knowledge and skills for estimation of various macro and micro nutrients in raw and processed foods.
2. To impart required knowledge and skills for estimation of various non nutrient components in raw and processed foods.
3. To impart the knowledge and skills for detection of common food adulterants.
4. To compare the estimated values with the recommended values and thereby assess the quality of foods.

Course Outline

1. Estimation of ash content in different foods.
2. Estimation of calcium content in different foods
   - Modified Gravimetric determination of calcium
   - Calcium determination using EDTA Titration
   - Calcium determination using redox titration.
3. Determination of phosphorous content of foods by colorimetry.
4. Determination of phytin phosphorus in foods.
5. Estimation of iron content of different foods by colorimetric methods.
6. Mohr titration of salt in butter (AOAC method 960.29)
7. Determination of Iodine content in salt.
8. Estimation of reducing and non reducing sugars in different foods by Lane Eynon's method.
9. Titrable acidity assessment in orange juice, yogurt, apple juice, grape juice etc.
10. Estimation of tannin content in tea.
11. Sodium content in different foods by Flame photometric method.
12. Potassium content in different foods by flame photometric method.
13. Determination of crude fiber in different foods.
14. Protein estimation in different foods by Kjeldahl method, Lowry's method and Ninhydrin method.
15. Crude fat determination by solvent extraction method.
16. Fat characterization with respect to the determination of the following:-
    Refractive index, melting point, solid fat index, cold test, smoke point, Iodine value, Saponification number, Acid value, Free fatty acids and Peroxide value.
17. Estimation of thiamin content of foods by Fluorimetric method.
18. Estimation of riboflavin content of foods by Fluorimetric method.
19. Estimation of Ascorbic acid content of different foods by 2,6 dichloro indophenol method.
20. Different chromatographic techniques. Paper chromatography, Thin layer chromatography and HPLC Techniques
    (1/2 day workshop will be held at the reputed institute on different techniques of chromatography)

21. Estimation of Lycopene in tomatoes
22. Estimation of oxalates from spinach.

References:

S. Suzanne Nielsen (2002) Introduction to the chemical analysis of foods CBS Publishers and Distributors, New Delhi.

Egan, H. Kirk, r. sawyer R (1981) Pearsons chemical analysis of foods 8th edition longman scientific and Technical.

A.O.A.C. (1990) official methods of Analysis 15th ed. Association of official analytical chemists, Washington, D.C.

Mayer, L.H (1987) Food Chemsitry CBS Publishers and distributors.

ISI Publications on different foods.

Pearson, D.(1970) Chemical analysis of foods, 6th ed., London, T.A. Churchill.

PRACTICAL EXAM --Guidelines

There shall be an university practical exam of 60 Marks to be conducted for 4 hours duration per batch.

DISTRIBUTION OF EXPERIMENTS

Q.1:-COLOURIMETRIC/FLUORIMETRIC EXPERIMENT	20 Marks
Q,2:-TITRIMETRIC EXPERIMENT.	15 Marks
Q.3 SPOTS	10 Marks
Q.4 VIVA-VOCE	10 Marks
Q.5 JOURNAL	5 Marks

FOOD PROCESSING & PRESERVATION

FOOD PRODUCT DEVELOPMENT (PRACTICAL) Marks:50
(PRACTICAL) Periods/week: 3

OBJECTIVES

1. To make the student familiar with the fundamentals of designing, executing and reporting the results of a research project.
2. To give the students an exposure to products available to the food industry.
3. To imbibe skills and knowledge to develop a food product using the principles of food science.

1. Food product formulation – A project

a. The student has to independently develop a food product, justifying any one or more of the following criteria.
   - Enhancement of Nutritive Value
   - Waste Utilisation
   - Cost Effectiveness
   - Value Addition

b. The student can choose any one of the categories listed below.
   - Ready to eat breakfast cereal
   - Probiotic yoghurt/ beverage
   - Salad dressing
   - Low fat snack product
   - Chocolate and confectionery
   - Fruit based snacks
   - Long shelf life snacks
   - High protein snacks/beverages (whey protein)
   - Pickled seafood
   - Any other innovative product.

The following steps will be followed.

a. Market Survey
b. Development of the formula (Modification of Home based recipes of Innovative)
c. Preparing a flow chart indicative of the operational processes to formulate and launch the product.
   Essential step, include
   Generation of Ideas. Concept development and testing, Product development, testing, Business Analysis, Marketing Strategy and launching of the product.
d. Evaluation of the product for Acceptability.
e. Oral and written presentation of the project.

References:

1. Smith Scott and Hui Y.H. (2004), Food processing Principles and Application, Blackwell publishing Aria, Australia.
2. Booth Gordon R. (1992) Snack food Chapman and Hall Inc. N.Y.
3. Duffy J.I. (1981) – Snack food Technology – Food tech Review No. 55, Noyes data corporation USA.
4. Fellows Peter, Hampton)1992) – Small Scale Food Processing – A guide to appropriate equipments Intermediate Tech Pub. (UK)

PRACTICAL EXAM-Guidelines

There shall be an internal practical examination of 25 marks to be conducted for 2 hours.

DISTRIBUTION OF EXPERIMENTS

1. Sensory evaluation of any food product 5 marks
2. Experiment based on physical/ chemical changes that take place during processing 10marks
3. Spot tests 5 marks
4. Viva voce 5 marks

Candidates without a certified journal will not be allowed to appear for the examination.

NOTE: In addition to the above exam of 25 marks, 25 marks will be allotted to the individu project work conducted by the student.

FOOD PROCESSING & PRESERVATION

M.Sc. II – COURSE OUTLINE.

Subject	Theory/ Practical	Internal Marks	University Exam Marks	Total marks	Periods Per week	University Exam hours	Internal /External
Food Safety& Quality Control	Theory	25	75	100	4	3	Both
Advances in Human Nutrition	Theory	15	60	75	3	2 ½	Both
Management & Business Administration	Theory	10	40	50	2	2	Both
Food Quality Control	Practical	15	60	75	5	5	Both
Dissertation	Practical	75	75	150	10		Both
Seminar	---	25		25			Internal
Industry Placement (2 months)	Practical	25		25			Both
TOTAL				500	24		

FOOD PROCESSING & PRESERVATION
M.Sc.- II
FOOD SAFETY AND QUALITY CONTROL.
(Theory)

Marks: 100
4 lectures/week

Objectives:

1. To acquire knowledge about quality and safety aspects of food.
2. To learn about the various ways of evaluating and controlling food quality.

Course Content:

UNIT I — No. of lectures (NOL)

Meaning and definition of food quality , Quality factors in foods, indicators of food quality. — 5

UNIT II

Meaning, importance and ways of Food Quality Assessment. — 5

UNIT III & UNIT IV

Methods of evaluation of quality:--subjective/sensory and objective

UNIT III.

Sensory evaluation – physiological bases, sensory characteristics of foods, types, selection and training of sensory panel, requirements for sensory evaluation tests, types of tests, analysis and interpretation of sensory evaluation tests — 15

UNIT IV.

Objective evaluation – Basic guidelines, physical methods to evaluate volume, specific gravity, moisture, texture rheological characteristics, chemical analysis methods, microscopic methods, indices of microbial quality — 15

UNIT V

Food Additives – brief overview, classification, guidelines for use, MAQ of food additives, toxicological studies, tests to determine safe level – Acute test, prolonged test, chronic test. — 15

UNIT VI

Food Adulteration - Meaning, detection of common adulterants. PFA laws related to food adulteration — 7

UNIT VI

Food Labeling and Nutrition labeling – Health Claims, Nutrition Claims, Nutrient definitions allowed on food labels. Laws related to food labeling. — 3

UNIT VII 10

Food Safety, hazards and risks – Meaning , definition , Types of hazards – Biological hazards, physical hazards, chemical hazards, nutrition – related diseases. Risk assessment and management. Natural toxicants in foods, pesticide residues in foods – Assessment and elimination, investigation of food borne disease outbreaks.

UNIT VIII 10

Hygiene and Sanitation Principles of food hygiene, personal hygiene, kitchen hygiene and sanitation. Microbiology in food plant sanitation, water quality assessment, insect and pest control, waste treatment and disposal, food vending and packaging standards used, employees' health.

UNIT IX 8

Control of Food quality : Principles of quality control. Government regulations (Food laws, orders) and amendments and national and international standards – ISI, Agmark, FPO, codex Alimentarius, ISO. Role of FDA in India.

UNIT X 7

Management systems in food quality control – HACCP, TQM and concept of food audit.

References:

Singhal, R.S. (1997) Handbook of indices of food quality and authenticity. Cambridge Woodhead Publishing, New York.

Langree, Karla 91996) Quantity Food Sanitation 5th edition John Wiley and Sons, New York.

Mcswane, D (1998) Essentials of Food Safety and Sanitation 1st edition, Prentice – Hall, Inc, New Jersey

Roday, S (1999) Hygiene and sanitation in food industry, Tata Mcgraw Hill Pub. Co. Ltd.

Potter, N.H (1997) Food Science, 5th edition, New Delhi, CBS Publishers and distributors New Delhi

Negi, Jagmohan (2004) Food and Beverage Laws: Food Safety and Hygiene, Amar Prakashan New Delhi.

Khanna, Shriram (2003) Food Standards and Safety in a globalised world. The Impact WTO and Codex.

McWilliams, Margaret (2000) Foods Experimental Perspectives, 4th edition, Prentice-Hall, Inc New Jersey.

PFA,ISI latest guidelines will be referred.

FOOD PROCESSING & PRESERVATION
M.Sc (II)

ADVANCES IN HUMAN NUTRITION.
(Theory)

Marks: 75
Lectures/week:3

Objectives:

- To understand the influence of nutrition on human growth and development.
- To study about the nutritional requirements and adaptations by the human body.
- To get an insight into the role of Nutrition for fitness and sports.
- To update knowledge in the area of Human Nutrition.

Course content:

No. of Lectures (NOL)

UNIT I

A) Contemporary issues in macronutrient metabolism and regulatory nutrients i.e. water and fat soluble vitamins and minerals. 8

B) Nutritional requirements – Proteins, energy (energy metabolism) vitamins and minerals 8
- determination of nutrient needs
- RDA for Indians

C) Nutritional requirements for special conditions 5
- Extreme climatic conditions
- Space Nutrition
- Calamities, disorders and emergencies

UNIT II

A) Nutritional adaptations - 8
- underlying mechanism
- Biochemical basis for adaptation
- Long and Short term adaptation
- Adaptation in chronic, severe undernutrition and overnutrition.
- Metabolic consequences of starvation.

B) Growth and development 7
- General aspects of Human Growth
- Cellular and physical growth.

UNIT III

Nutrition and the Brain 10
- Nervous system and Nerve Cell
- Nutrient precursors of neuro transmitters.
- Nutrition and behaviour
- Effect of undernutrition on neuronal development.

UNIT IV

Nutrition and Physical fitness. 11

- Basic components of energy formation during exercise.
- Interrelationship of Carbohydrate, Protein and Lipid metabolism
- Biochemical assessment of physical exertion
- Effect of nutritional status on physical performance.
- Ergogenic aids.
- Eating disorders among athletes
- Role of water, electrolytes, vitamins & minerals in physical fitness

UNIT V

Complementary Nutrition & Other components with health relevance. 18

- Bioactive Dietary Components
- Nutraceuticals and Functional foods in Human Nutrition
- Phytochemicals
- Carotenoids
- Plant sterols
- Polyphenolics
- Phytoestrogens
- Polyols
- Prebiotics and probiotics
- Dietary Supplements
- Vitamins and minerals
- Natural Health products
- Moderate and megadosing

References.

Benordot, D (1999) Nutrition for serious athletes and advanced guide to foods, fluids and supplements for training and performance champaign IL. Human Kinetic.

Grodd, J.L. and Gropper, S.S. (1999) Adfvanced Nutrition and human metabolism. Belmount CA Wodworth/Thomson learning.

Judith E. Broch (1998) Nutrition Now, West/wadsworth International Thomson Pub. Co.

Williams, Cand devlin, T.J. (1992) Foods Nutrition and Sports performance E and N Sposs I Ed.

Goodhart R.S.S and Shils, M.E (1998) Modern nutrition in health and disease. Philadelphia Lea and Febiger.

Stipanuk Martha H. 2006 Biochemical, physiological, molecular Aspects of human Nutrition – Saunders ELSEVIER.

Paul I, Turner ER, ross Don – (2006) (2nd ed.) Discovering Nutrition – Jones and Bartlett Publishers – Canada.

Geissler C. Powers H (11th ed.) (2005) human Nutrition ELSEVIER Churchill Livinstone ISBN

21egler, E.E and Filer, L.J. (1996) Present knowledge in nutrition. Washington D.C. International Life Sciences institute.

Journals to be referred:-

1) Journal of American Dietetic Association USA – The American dietetics Association.
2) Nutrition reviews, New York Springton verlog

3) The American – Journal of clinical Nutrition – USA Official journal of the American Society for Clinical Nutrition Inc.
4) The Indian journal of Nutrition and dietetics.

M.Sc II
MANAGEMENT AND BUSINESS ADMINISTRATION

Marks: 50
No.of Lectures :2/week

Objectives:

1. To enhance personal & professional performance.
2. To facilitate better administration & management skills

Course Content:

No. of Lectures:(NOL)

UNIT I

Developing and Managing Human Resources. 12

An overview of :-

- Job Analysis
- Job Design
- Job Evaluation
- Manpower planning
- Recruitment and Selection
- Orientation and Induction.
- Performance Appraisal
- Leadership and Motivation.
- Self Awareness
- Training and Development.
- Compensation and Reward
- Group Dynamics: Grievance Management, Conflict Resolution.
- Human Resource Audit.

UNIT II

Marketing and Marketing Management process 11

A brief exposure to:

- Meaning and importance of Marketing
- Marketing Mix-elements, factors influencing marketing mix.
- Market Research
- Market Segmentation.
- Supply Chain Management

UNIT III

A) Financial issues: An overview of:

- Budgeting 8
- Concepts of cost : Fixed and variable cost, marginal cost, opportunity cost, break even analysis
- Sources of finance
- Auditing
- Evaluation parameters

B) Quality Management 6

- Approaches to quality improvement
- Tools used in the process
- Issues for quality improvement
- Standards of quality in food industry.

UNIT IV

Entrepreneurship in food service 6

- Starting a business
- Legal requirements
- Skills and knowledge needed.
- Planning strategies for marketing products.

UNIT V

A) Managing information: 2

- The need for information
- Sharing and retrieving information.

B) Ethics and social responsibility. 4

- Meaning
- Responsibilities of internal & external beneficiaries.

REFERENCES

1) Agarwal, T. (2007) Strategic Human Resource Management Oxford University Press – New Delhi.
2) Aswathappa, K. (2005). Human Resource and Personnel Management – Text and Cases Tata McGraw – Hill Publishing Co. Ltd. New Delhi.
3) Boyd, H.W. Walker, O.C. and Larreche, J. (1995) Marketing Management – A Strategic Approach with a global Orientation 2nd ed. Irwin Chicago.
4) Cartwright, R. Collins, M, green, G and candy, A (2001). The Handbook for Managing resources and Information Infinity books. New Delhi.
5) Ivancevich, J.M. Donnelly, J.H and Gibson, J.L. (1996). management – principles and functions 4th ed. All India Traveller Bookseller. Delhi.
6) Kale, N.G. (2003) Principles and practice of Marketing. Vipul prakashan – Mumbai.
7) Kotler, P. (2003) marketing management 11th ed. Pearson Education (Singapore) Pte. Ltd. Delhi.
8) Rao, V.S.P. (2005) Human Resource management – text and cases 2nd ed. Excel [illegible] New Delhi.
9) Shookla, M.S. (2004). A Handbook of Human relations (with structured experiences and Instruments). Macmillan India Ltd. Delhi.
10) Singh, P.N. (1998). Developing and Managing Human resources 3rd ed. Suchandra Publications. Mumbai.

FOOD PROCESSING & PRESERVATION

FOOD QUALITY CONTROL
(PRACTICAL)

Marks-75
5 Periods/wk

Objectives:

1) To learn quality control measures as per domestic and international requirements.
2) To conduct physical, chemical and nutritional analysis of commonly consumed raw and processed foods and the impact of packaging on quality.
3) Be familiar with various tests and standards used for quality assurance used for food safety hazards, contaminants, adulterants, waste management and implementation of HACCP at various food service and industrial units.

Course content:

1. Techniques of sampling and grading of foods as per BIS, AGMARK and International standards.
2. Complete physico chemical analysis of any two commonly used foods such as flour, honey, oils, tea, milk, jams and jellies as per their constituents.: Crude Fat, Protein, Moisture, Ash, FFA, Vitamin C and any other parameters..
3. Analysis of water from at least five different sources as per BIS standards, its hardness and safety.
4. Indian Standards for the following foods :
   Wheat flour, Semolina, Bakery products, vegetables, fruits and their products, spices & condiments, and Processed foods.
5. Estimation of anti nutritional factors like trypsin inhibitors and phytic acid.
6. Determination of colour, flavour and texture in at least 2 commonly consumed foods like fruit squashes, apple biscuits etc. using sensory and objective evaluation using Spectrophotometer, , Texturometer, Penetrometer or any other instruments.
7. Sensory evaluation of different types of food products. Tomato sauce, ice cream, tea & coffee etc.
8. Microbial analysis of certain raw, processed and roadside foods.

VISITS TO FOOD QUALITY CONTROL LABORATORIES FOR DEMONSTRATION OF VARIOUS INSTRUMENTS AND EQUIPMENTS USED IN FOOD QUALITY CONTROL

References:

1. Bureau of Indian standards: specifications and standard methods volume I to XII.
2. Food and Agriculture organization (1980) Manual of Food quality Control 2. Additives contaminants Techniques, Rome.
3. Kirk B.S, and sawyer R (1991) Pearson's composition and analysis of foods, 9th ed. Longmans scientific and Technical England.
4. Mahindru S.N. (2000). Food safety A. Techno legal Analysis Tata McGraw Hill Publishing Co. Ltd New Delhi.
5. Nielson S.S. (1994) Introduction to the chemical Analysis of Foods Jones and Bartlet Publishers Boston.

R-5890-EXAMINATION SCHEME

MARKS-60

1. Qualitative/quantitative analysis 15
2. Sensory evaluation 10
3. Spots 10
4. Quiz/Written test 10
5. Viva Voce 10
6. Journal 05

Candidates without certified journals will not be allowed to appear for the examination