

**AC 10/02/2012**  
**Item No. 4.45**

**UNIVERSITY OF MUMBAI**



**Syllabus**

**SEMESTER I & SEMESTER II**

**Program: M.Sc.**

**Course: Home Science**

**Branch IB: Food Processing and Preservation**

**(Self Financing Course)**

**(Credit Based Semester and Grading System with effect  
from the academic year 2011–2012)**

**SEMESTER I**

<b>Course Code</b>	<b>Title</b>	<b>Credits</b>	<b>Periods</b>	<b>Marks</b>
PSHSIB101	Research Methods and Statistics	4	4	100
PSHSIB102	Food Processing and Technology	4	4	100
PSHSIB103	Food Science	4	4	100
PSHSIB104	Food Microbiology	3	3	75
PSHSIB105	Nutrition through Life Cycle	3	3	75
PSHSPIB101	Chemical Analysis of Foods	3	3	75
PSHSPIB102	Food Product Development	3	3	75
	Total:	24	24	600

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB101	Research Methods and Statistics	4	100	4

### RESEARCH METHODS AND STATISTICS

No. of Credits: 4

#### Objectives

1. To build in students appreciation for high quality research in each of their specialisations.
2. To introduce students to the skills needed in conducting a research in their specialisation.
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	Lectures
<b>UNIT I</b> <b>1 A. Introduction and Overview</b> (a) What is a research? (b) Objectivity and subjectivity in scientific inquiry: Premodernism, modernism, and postmodernism (c) Steps in the research process (d) Importance of research in general, and in each discipline (e) Illustration of research in each of the three specialisations: Foods, Nutrition, and Dietetics; Human Development; and, Textile and Fashion Technology (f) Qualitative versus quantitative research <b>1 B. The beginning steps in the research process</b> (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	15
<b>UNIT II</b> <b>2 A. Variables</b> (a) Definition (b) Characteristics (c) Types (d) Levels of measurement <b>2 B. Measurement</b> (a) Conceptual definitions and operational definitions (b) Types of validity and reliability in quantitative research <b>2 C. Data entry in quantitative research</b> (a) Codebook and mastersheet (b) Creating data files and data management	15
<b>UNIT III</b> <b>3. A. Introduction and overview to statistics</b> (a) Role of statistics in (quantitative) research (b) Definition/changing conceptions (c) Prerequisite concepts in mathematics (e.g., properties of the summation sign, basic algebra) <b>3 B. Descriptive Statistics for summarizing ratio level variables</b> (a) Frequencies and percentages (b) Computing an average/measure of a central tendency  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 Why? (inadequacy of the mean)	15

	Minimum value and maximum value Range Interquartile range Variance and standard deviation (e) Discrete and continuous variables (f) Histograms and line graphs	
<b>UNIT IV</b>	<b>4 A. Descriptive Statistics for summarizing nominal, ordinal and interval level variables</b> <b>4 B. Demonstration of computer software such as the Statistical Package for the Social Sciences (SPSS)</b> (a) Data entry (b) Data Management (c) Descriptive Statistics <b>4. C. Probability: Foundation of Advanced/Inferential Statistics</b> (a) Definition (b) Role of probability in research and statistics (c) Elementary concepts in probability Sample space, experiment, event/outcome/element of the sample space Equally likely outcomes and the uniform probability model Stabilization of the relative frequency	<b>15</b>

**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. (2000). *Foundations of behavioral research*. Orlando, Florida: Harcourt.
- Leong, F.T.L. & Austin, J. T. (Eds.) (1996). *The psychology research handbook*. New Delhi: Sage.

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB102	Food Processing and Technology	4	100	4

### FOOD PROCESSING AND TECHNOLOGY

No. of Credits: 4

#### Objectives

1. To impart a systematic knowledge of basic and applied aspects of food processing and technology.
2. To gain in-depth 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		Lectures
<b>UNIT I</b>	<b>Cereal and cereal product technology</b> <ol style="list-style-type: none"> <li>i. Composition and commercial value of the following cereals</li> <li>ii. Wheat, rice, maize, barley, oats, rye, ragi and bajra</li> <li>iii. Processing technology of the following. <ol style="list-style-type: none"> <li>a. Yeast leavened breads</li> <li>b. Muffins</li> <li>c. Cakes</li> <li>d. Biscuits</li> <li>e. Break fast cereals</li> <li>f. Pasta products</li> </ol> </li> </ol>	15
<b>UNIT II</b>	<b>Pulses and legume technology</b> <ol style="list-style-type: none"> <li>i. Elimination of toxic factors</li> <li>ii. Extruded soya products</li> <li>iii. Fermented soya products</li> <li>iv. Soya milk and ground nut milk</li> </ol>	15
<b>UNIT III</b>	<b>Technology of oil seeds</b> <ol style="list-style-type: none"> <li>i. Extraction</li> <li>ii. Refining of oil</li> <li>iii. Hydrogenation, plasticizing and tempering</li> </ol> <b>Technology of oil seeds</b> <ol style="list-style-type: none"> <li>i. Blending of oils</li> <li>ii. Margarine, shortenings and spreads</li> <li>iii. Confectionary fats, cocoa butter, cocoa powder</li> <li>iv. Mayonnaise</li> </ol>	15
<b>UNIT IV</b>	<b>Fruit and Vegetable technology</b> <ol style="list-style-type: none"> <li>i. Frozen vegetables and fruits</li> <li>ii. Canned vegetables and fruits</li> <li>iii. Dried fruits and vegetables</li> <li>iv. Chutney, pickle and sauces</li> <li>v. Jams, jellies and marmalades and fruit cheese</li> <li>vi. Tomato juice &amp; orange juice processing-Puree, pastes and powders</li> </ol>	15

#### References

- SBP Board of consultants and Engineers (1998). *SBP Handbook of Oil Seeds, Oil, Fats and Derivatives*. Delhi: SBP House.
- Booth, G.R. (1997). *Snack Food*, New Delhi: CBS Publishers and distributors.
- Salunkhe, D.K. & Kadam, S.S. (2005). *Handbook of Vegetable Science and Technology*. Marcel Dekker, INC First Indian Reprint .
- D'Cunha, J.F. (1998). *Modern Food Packaging*, Mumbai: IIP.
- Duffy, J.I., (1981). *Snack Food Technology*, New Jersey: Noyes Data Corporation.
- Smith, J.S. & Hui, Y.H. (2004). *Food Processing Principles and Applications*. Blackwell Publishing.
- Kent N.L. (1993). *Technology of cereals* (4<sup>th</sup> ed.) Pergamon Press.
- Chakraborty, M.M. (2003). *Chemistry and Technology of Oils and Fats* Allied publishers Pvt. Ltd.
- Mahadeviah, M. & Gowramma, R.V. (1996). *Food Packaging Materials*. New Delhi: Tata Mc Graw Hill Pub. Co. Ltd.
- Fellows, P. & Hampton, A. (1992). *Small Scale Food Equipment Intermediate Technology*. Publications in Association with CTA.

Potter, N. & Hotchkiss, J. H. (1997). *Food Science* New Delhi: CBS Publishers and Distributors.  
Ahulluwalia, V. (2007). *Food Processing* , New Delhi: Paragon International Publishers.

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB103	Food Science	4	100	4

### FOOD SCIENCE

No. of Credits: 4

#### 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		Lectures
<b>UNIT I</b>	<b>Food science and chemistry</b> i. Meaning and scope of food sciences ii. Composition of food iii. Functional groups, isomers and stereochemistry, bonding, polarity and solubility iv. Physical properties of food preparations: energy transfer, state of matter dispersions emulsions, gels, foams	<b>15</b>
<b>UNIT II</b>	<b>Chemistry of water</b> i. Water content of foods ii. Physical and chemical properties of water and ice iii. Water activity and microbial growth iv. Role of water in food	<b>15</b>
<b>UNIT III</b>	<b>Carbohydrate chemistry</b> i. Classification, structures and food sources ii. Chemical change of sugars in foods iii. Hydrolysis, Mallard reaction, crystallization changes in starch - pasting, gelatinization, gelation, syneresis, retrogradation, dextrinization iv. Modified and resistant starches hydrolysate products of starch. <b>Gums:</b> Functions, types, sources and uses <b>Pectic substances:</b> Properties, gel formation jams, jellies, marmalade, crystalline candies, syrups, sauces, confectionary.	<b>15</b>
<b>UNIT IV</b>	<b>Lipids in food</b> i. Classification, structure and functions of lipids ii. Physical and chemical properties iii. Chemical constants Lipolysis, Peroxidation, Auto oxidation and Hydrogenation of lipids. iv. Effect of storage on chemical constituents of fats v. Fat as frying medium, emulsifiers shortening agents, whipping agents, tenderizers vi. Thermal decomposition of lipids and rancidity in fats vii. Structured lipids and fat substitutes	<b>15</b>

#### References

- McWilliams, M (2007) *Foods: Experimental Perspectives* (5<sup>th</sup>ed.), New Jersey: Macmillan Publishing Co.  
 Manay, N. S. and Shadarksharaswamy, M. (1997) *Foods: Facts and Principles* New Age International Publishers, New Delhi.  
 Potter, N.N. and Hutchkiss, J.H (1997) *Food Science* (5<sup>th</sup> ed.) New Delhi: CBS Publishers and Distributors.

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB104	Food Microbiology	3	75	3

### FOOD MICROBIOLOGY

No. of credits: 3

#### Objectives

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

Course Content	Lectures
<b>UNIT I</b> <b>Introduction to Microbiology</b> <ol style="list-style-type: none"> <li>Evolution of Microbiology</li> <li>Characterization, classification and identification of microorganisms</li> <li>Taxonomy</li> <li>Role and significance of microorganisms in foods</li> </ol>	15
<b>UNIT II</b> <b>Intrinsic parameters of foods that affect microbial growth.</b> <ol style="list-style-type: none"> <li>pH</li> <li>Moisture content</li> <li>Oxidation – reduction potential (Eh)</li> <li>Nutrient content</li> <li>Anti-microbial constituents</li> <li>Biological structures</li> </ol> <b>Extrinsic parameters of foods that affect microbial growth.</b> <ol style="list-style-type: none"> <li>Temperature of storage</li> <li>Relative humidity of environment</li> <li>Presence and concentration of gases in the environment</li> </ol>	15
<b>UNIT III</b> <b>Microbial flora, incidence and types of microbial spoilage in the following foods:-</b> <ol style="list-style-type: none"> <li>Cereals, millets and their products</li> <li>Pulses, legumes and their products</li> <li>Nuts and oils seeds and their products</li> <li>Vegetables and fruits and their products</li> </ol>	15

#### References

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



Course Code	Title	Lectures/week	Marks	Credits
PSHSIB105	Nutrition Through the Life Cycle	3	75	3

### NUTRITION THROUGH THE LIFE CYCLE

No. of Credits: 3

#### Objectives

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

Course Content	Lectures
<b>UNIT I</b> <b>Basics of Nutrition</b> Brief overview of functions, sources and deficiency of Macro and Micronutrients Balanced Diet <b>Nutrition during Pregnancy</b> <ol style="list-style-type: none"> <li>a) Reproductive Physiology (Male and Female)</li> <li>b) Nutrition related disruptions in fertility (under and over nutrition)</li> <li>c) Physiology of pregnancy</li> <li>d) Effect of Nutritional Status on pregnancy outcome.</li> <li>e) Nutritional requirements and dietary guidelines</li> <li>f) Nutrition related complications</li> <li>g) Complications of pregnancy</li> <li>h) HIV/AIDS during pregnancy – Dietary concerns</li> <li>i) Role of Exercise &amp; Fitness</li> <li>j) Adolescent Pregnancy</li> </ol>	15
<b>UNIT II</b> <b>Nutrition during lactation</b> <ol style="list-style-type: none"> <li>a) Physiology of Lactation</li> <li>b) Human milk composition</li> <li>c) Nutritional requirements &amp; dietary guidelines</li> <li>d) Benefits of Breast Feeding</li> <li>e) Galactogouges</li> <li>f) Lactation Management in Normal &amp; Special conditions</li> </ol> <b>Nutrition in infancy</b> <ol style="list-style-type: none"> <li>a) Physiological development, Motor, Cognitive development.</li> <li>b) Energy and nutrient needs.</li> <li>c) Feeding in early and late infancy</li> <li>d) Development of infant feeding skills</li> <li>e) Common nutrition problems</li> <li>f) Feeding Preterm and low birth weight infants</li> </ol>	15
<b>UNIT III</b> <b>Nutrition in Toddlerhood and Preschool, Childhood &amp; Preadolescent</b> <ol style="list-style-type: none"> <li>a) Growth and development</li> <li>b) Nutritional requirements</li> <li>c) Nutrition for children with special health care needs</li> <li>d) Feeding problems</li> <li>e) Nutritional concerns and prevention of nutrition related disorders               <ol style="list-style-type: none"> <li>i. Obesity – underweight</li> <li>ii. Deficiency condition</li> <li>iii. Allergies, eating disorders</li> </ol> </li> </ol>	15

#### References

- Bennion, H. (1979) *Clinical Nutrition*, New York Harper and Raw Publishers
- Brown, J. E. (1998). *Nutrition Now*, West/Wadsworth: International Thomson Pub. Co.
- Brown, J. E., Sugarman, I. J. (2002). *Nutrition through the Life Cycle*, Wadsworth Thomson Learning.
- Donald, B., MCColmick, Bier, D. M. (1997). *Annual Review of Nutrition* (vol. 19)
- Goodhart, R. S. S. and Shils, M. E. (1998). *Modern Nutrition in Health and Disease*. Philadelphia: Lea and Febiger.
- Groff, J. L and Gropper, S. S. (1999). *Advanced Nutrition and Human Metabolism*, Belmont CA: Wadsworth/Thomson Learning.

Jackson, M. S., Rees, Jane, M., Golden, Neville, H.; Irwin Charles, E. (ed) (1997). *Adolescent Nutritional Disorders*. New York: The New York Academy of Science.

Lee, R. S. and Marcus, C. (1990) *Omega – 3 Fatty Acids in Health and Disease*. – Marcel Dekker Inc.

Mahan L. K. & Stump S.E. (11<sup>th</sup> ed.) (2004) *Krause's Food Nutrition and Diet Therapy* – Saunders USA: Elsevier.

Wardlaw, G. M. Insel, P. M. and Seyler M. F. (1994). *Contemporary Nutrition; Issues and Insights*. St. Louis: Mosby.

Warthington, R., Vermeersch J. and Willams, S. (1985). *Nutrition in Pregnancy and Lactation*. St. Louis: Times Mirror/Mosby College Publishing.

Ziegler, E. E. and Filer L. J. (1996). *Present Knowledge in Nutrition*, Washington D.C.: International Life Science Institute.

### **Journals**

Journal of American Dietetic Association USA – The American Dietetics Association.

Nutrition Reviews, New York: Springer-Verlag

The American – Journal of Clinical Nutrition – USA Official Journal of the American Society for Clinical Nutrition Inc

The Indian Journal of Nutrition and Dietetics

Course Code	Title	Periods/week	Marks	Credits
PSHSPIB101	Chemical Analysis of Foods	3	75	3

### CHEMICAL ANALYSIS OF FOODS

No. of Credits: 3

#### Objectives

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

Course Content		Lectures
<b>UNIT I</b>	i. Estimation of ash content in different foods. ii. Estimation of calcium content in different foods. a. Modified Gravimetric determination of calcium b. Calcium determination using EDTA titration c. Calcium determination using redox titration iii. Determination of phosphorous content of foods by colorimetry iv. Determination of phytin phosphorus in foods v. Estimation of iron content of different foods by colorimetric methods vi. Mohr titration of salt in butter (AOAC method 960.29)	<b>15</b>
<b>UNIT II</b>	i. Determination of iodine content in salt ii. Estimation of reducing and non reducing sugars in different foods by Lane Eynon's method.	<b>15</b>
<b>UNIT III</b>	i. Titrable acidity assessment in orange juice, yogurt, apple juice and grape juice ii. Estimation of tannin content in tea iii. Sodium content in different foods by Flame photometric method iv. Potassium content in different foods by flame photometric method	<b>15</b>

#### References

- Nielsen, S. Suzanne (ed) (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* 8<sup>th</sup> edition longman scientific and Technical, U.K.
- A.O.A.C. (1990) *Official Methods of Analysis* 15<sup>th</sup> ed. Association of official analytical chemists, Washington, D.C.
- Meyer, L.H (1987) *Food Chemsitry* CBS Publishers and distributors, Delhi
- ISI Publications on different foods.
- Pearson, D.(1970) *Chemical Analysis of Foods*, 6<sup>th</sup> ed., London, T.A. Churchill.

Course Code	Title	Periods/week	Marks	Credits
PSHSPIB102	Food Product Development	3	75	3

### FOOD PRODUCT DEVELOPMENT

No. of credits: 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.

Course Content		Periods
<b>UNIT I</b>	<b>Food product formulation</b> Enhancement of Nutritive Value Waste Utilisation Cost Effectiveness Value Addition Using any one of the product categories given below Ready to eat breakfast cereal Probiotic yoghurt/ beverage Salad dressing Low fat snack product	<b>15</b>
<b>UNIT II</b>	Development of the formula (Modification of Home based recipes of Innovative) Preparing a flow chart indicative of the operational processes	<b>15</b>
<b>UNIT III</b>	Generation of ideas Concept development and testing, product development, testing	<b>15</b>

**SEMESTER II**

<b>Course Code</b>	<b>Title</b>	<b>Credits</b>	<b>Periods</b>	<b>Marks</b>
PSHSIB201	Research Methods and Statistics	4	4	100
PSHSIB202	Food Processing and Technology	4	4	100
PSHSIB203	Food Science	4	4	100
PSHSIB204	Food Microbiology	3	3	75
PSHSIB205	Nutrition through Life Cycle	3	3	75
PSHSPIB201	Chemical Analysis of Foods	3	3	75
PSHSPIB202	Food Product Development	3	3	75
	Total:	24	24	600

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB201	Research Methods and Statistics II	4	100	4

### RESEARCH METHODS AND STATISTICS

No. of Credits: 4

#### Objectives

1. To help students develop the skills needed in conducting a research in their specialisation.
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	Lectures
<b>UNIT I</b> <b>1 A. Sampling techniques in quantitative research</b> (a) Sampling methods in current use/examples from current research (b) Issues with regard to sampling techniques  <b>1 B. Research designs in quantitative research</b> Distinguishing between the following research designs; and, selecting research designs that are congruent with one's research purpose. (a) Longitudinal versus cross-sectional (b) Experimental versus quasi-experimental versus correlational (c) Exploratory versus descriptive versus explanatory	15
<b>UNIT II</b> <b>2 A. Qualitative research methods</b> (a) Ideology/worldview of the qualitative researcher (b) Research designs in qualitative research (c) Sampling techniques in qualitative research (d) Data collection methods in qualitative research (e) Data analytic strategies in qualitative research (f) Reporting of results in qualitative research  <b>2B. Scientific writing</b> (a) Distinguishing scientific writing from popular and literary writing styles (b) Characteristics/principles of scientific writing (c) Examples of good scientific writing (d) Writing a research proposal (d) Reporting statistical findings in text  <b>2 C. Ethics</b> (a) In academia (b) In research in general (c) In research with human subjects (d) In research with animal subjects	15
<b>UNIT III</b> <b>3 A. Other concepts needed for the use of advanced/inferential statistics</b> (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  <b>3 B. Using an advanced statistical method</b> (steps in using an advanced statistical method)	15

<b>UNIT IV</b>	<p><b>4 A. To study statistics that allows us to contrast phenomena</b></p> <ul style="list-style-type: none"> <li>(a) Univariate chi-square test</li> <li>(b) Bivariate chi-square test</li> <li>(c) t- or z- test for contrasting two independent groups</li> <li>(d) Paired t-test</li> <li>(e) ANOVA</li> </ul> <p><b>4 B. To study statistics that allows us to examine relationships between variables</b></p> <ul style="list-style-type: none"> <li>(a) Bivariate chi-square test</li> <li>(b) Product-moment correlation coefficient</li> </ul> <p><b>4 C. Ethics in the use of statistics</b> (e.g., the importance of test assumptions, the number of statistical tests in a research and levels of significance)</p>	<b>15</b>
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**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. (2000). *Foundations of Behavioral Research*. Orlando, Florida: Harcourt.
- Leong, F.T.L., & Austin, J. T. (Eds.) (1996). *The Psychology Research Handbook*. New Delhi: Sage.

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB202	Food Processing and Technology	4	100	4

### FOOD PROCESSING AND TECHNOLOGY

No. of Credits: 4

#### Objectives

1. To impart a systematic knowledge of basic and applied aspects of food processing and technology.
2. To gain in-depth 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	Lectures
<b>UNIT I</b> <b>Milk Processing technology</b> <ol style="list-style-type: none"> <li>i. Milk composition</li> <li>ii. Factors affecting milk quality</li> <li>iii. Physical and chemical properties</li> <li>iv. Milk processing               <ol style="list-style-type: none"> <li>a. Pasteurization</li> <li>b. Homogenization</li> <li>c. Sterilization</li> <li>d. Effect of processing on nutritive value</li> </ol> </li> </ol> <b>Milk Products</b> <ol style="list-style-type: none"> <li>i. Milk powder</li> <li>ii. Sweetened condensed milk</li> <li>iii. Butter</li> <li>iv. Cheese</li> <li>v. Ice cream</li> <li>vi. Shrikhand</li> <li>vii. Yogurt</li> <li>viii. Flavoured milk products</li> <li>ix. Milk substitutes</li> <li>x. Probiotic products</li> <li>xi. Milk chocolate</li> </ol>	<b>15</b>
<b>UNIT II</b> <b>Meat, Fish, Poultry and Egg</b> <b>Meat Processing</b> <ol style="list-style-type: none"> <li>i. Bacon</li> <li>ii. Ham</li> <li>iii. Hot dogs</li> <li>iv. Balogna</li> </ol> <b>Poultry and Egg</b> <ol style="list-style-type: none"> <li>i. Frozen poultry</li> <li>ii. Poultry nuggets</li> <li>iii. Poultry meat products</li> <li>iv. Egg products</li> </ol> <b>Fish Processing</b> <ol style="list-style-type: none"> <li>i. Meal</li> <li>ii. Fish oil</li> <li>iii. Frozen fish</li> <li>iv. Canned fish</li> <li>v. Dried and smoked fish</li> </ol>	<b>15</b>
<b>UNIT III</b> <b>Fermentation technology- Principle &amp; techniques</b> <b>Beverages</b> <ol style="list-style-type: none"> <li>i. Alcoholic Beverages Beer, Wine</li> <li>ii. Non Alcoholic Beverages</li> <li>iii. Coffee, Tea, &amp; Carbonated beverages</li> </ol> <b>Newer trends in beverages.</b>	<b>15</b>



<b>UNIT IV</b>	Convenience foods - Snack food technology Functional foods & Nutraceuticals – incorporation in food products Food fortification Food packaging – Packages with special feature Newer trends in packaging technology	<b>15</b>
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**References**

- SBP Board of consultants and Engineers (1998). *SBP Handbook of Oil Seeds, Oil, Fats and Derivatives*. Delhi: SBP House.
- Booth, G.R. (1997). *Snack Food*, New Delhi: CBS Publishers and distributors.
- Salunkhe, D.K. & Kadam, S.S. (2005). *Handbook of Vegetable Science and Technology*. Marcel Dekker, INC First Indian Reprint .
- D’Cunha, J.F. (1998). *Modern Food Packaging*, Mumbai: IIP.
- Duffy, J.I., (1981). *Snack Food Technology*, New Jersey: Noyes Data Corporation.
- Smith, J.S. & Hui, Y.H. (2004). *Food Processing Principles and Applications*. Blackwell Publishing.
- Kent N.L. (1993). *Technology of cereals* (4<sup>th</sup> ed.) Pergamon Press.
- Chakraborty, M.M. (2003). *Chemistry and Technology of Oils and Fats* Allied publishers Pvt. Ltd.
- Mahadeviah, M. & Gowramma, R.V. (1996). *Food Packaging Materials*. New Delhi: Tata Mc Graw Hill Pub. Co. Ltd.
- Fellows, P. & Hampton, A. (1992). *Small Scale Food Equipment Intermediate Technology*. Publications in Association with CTA.
- Potter, N. & Hotchkiss, J. H. (1997). *Food Science* New Delhi: CBS Publishers and Distributors.
- Ahulluwalia, V. (2007). *Food Processing* , New Delhi: Paragon International Publishers.

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB203	Food Science	4	100	4

**FOOD SCIENCE**

**No. of Credits: 4**

**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	Lectures
<b>UNIT I</b> <b>Proteins in foods</b> <ol style="list-style-type: none"> <li>Classification and physico-chemical properties of amino acids, peptides, viz. glutathione, carnosine, anserine proteins</li> <li>Structure of proteins at four levels of organization</li> <li>Bonds stabilizing protein structure, collagen, gelatin</li> <li>Reactions and changes of proteins in food: hydrolysis, denaturation, coagulation, protein gel formation</li> <li>Development of gluten complex, gelatin gel, modified and derived proteins, texturised vegetable proteins, use of synthetic amino acids for food fortification</li> <li>Classification and use of enzymes in food industry</li> <li>Proteolytic immobilized, bound coenzymes factors affecting enzyme activity, microbial enzymes and genetically engineered enzymes</li> </ol>	<b>15</b>
<b>UNIT II</b> <b>Food color</b> <ol style="list-style-type: none"> <li>Theory of food colors, conjugation in molecules</li> <li>Natural food colors – heme pigments and plant pigments, chlorophyll, carotenoids, anthocyanins, anthoxanthins, tannins, caramel</li> <li>Artificial food colors</li> <li>Measurement systems for food colors</li> <li>Effect of processing, pH on food colours and pigments</li> </ol> <b>Food flavours</b> <ol style="list-style-type: none"> <li>Food flavours: chemistry, flavour enhancement and olfaction</li> <li>Relationship between odour and molecular structure e.g. musk, camphor, caramel, roasted almond</li> <li>Examples of food flavour principles in common foods – carbonyl, phenolic, esters, terpenes, sulphur compounds</li> </ol>	<b>15</b>
<b>UNIT III</b> <b>Modern technology in food stability</b> <ol style="list-style-type: none"> <li>Freezing, lyophilization, hurdle technology, vacuum drying, radiation technology.</li> <li>Modified atmosphere packaging</li> <li>Concept of minimally processed foods application of nanotechnology, biotechnology and genetic engineering</li> </ol>	<b>15</b>
<b>UNIT IV</b> <b>Product development</b> <ol style="list-style-type: none"> <li>Global and Indian scenario w.r.t. food product development</li> <li>Consumption and dietary pattern of traditional and non-traditional foods</li> <li>Current market scenario and techniques of market survey</li> <li>Development of entrepreneurship skills, special schemes for women</li> <li>Project planning, investments and financing</li> </ol>	<b>15</b>

**References**

- McWilliams, M (2007) *Foods: Experimental Perspectives* (5<sup>th</sup>ed.), New Jersey: Macmillan Publishing Co.  
 Manay, N. S. and Shadarksharaswamy, M. (1997) *Foods: Facts and Principles* New Age International Publishers, New Delhi.  
 Potter, N.N. and Hutchkiss, J.H (1997) *Food Science* (5<sup>th</sup> ed.) New Delhi: CBS Publishers and Distributors.

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB204	Food Microbiology	3	75	3

### FOOD MICROBIOLOGY

No. of credits: 3

#### 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	Lectures
<b>UNIT I</b> <b>Microbial flora, incidence and types of microbial spoilage in the following foods:-</b> <ol style="list-style-type: none"> <li>Meat, fish, poultry and eggs and their products.</li> <li>Milk and milk products</li> <li>Processed foods – Dehydrated, canned, frozen and fermented foods</li> </ol>	15
<b>UNIT II</b> <b>Food Borne Diseases</b> Infections and Poisonings – Causes, Sources and Prevention	15
<b>UNIT III</b> <ol style="list-style-type: none"> <li>Control of microorganisms by physical and chemical agents</li> <li>Enzymes from microorganisms and microorganisms as foods</li> </ol>	15

#### References

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

Course Code	Title	Lectures/week	Marks	Credits
PSHSIB205	Nutrition Through the Life Cycle	3	75	3

### NUTRITION THROUGH THE LIFE CYCLE

No. of Credits: 3

#### Objectives

1. To understand the changes in human body composition during different stages of life.
2. To study the influence of nutrition on man during the different stages of life cycle.
3. To be aware and update the knowledge in the field of applied nutrition during the life cycle.

Course Content		Lectures
<b>UNIT I</b>	<b>Nutrition in adolescence</b> <ol style="list-style-type: none"> <li>a) Growth and development</li> <li>b) Physiological and Psychological changes</li> <li>c) Nutritional requirements of adolescents</li> <li>d) Health and eating related behavior</li> </ol> <b>Nutrition situation with special needs</b> <ol style="list-style-type: none"> <li>a) Pregnancy</li> <li>b) Eating disorders</li> <li>c) Obesity – underweight</li> <li>d) Substance abuse</li> <li>e) Deficiency conditions</li> <li>f) Sports and athletics</li> </ol>	<b>15</b>
<b>UNIT II</b>	<b>Nutrition in the adult years</b> <ol style="list-style-type: none"> <li>a) Physiological and Psychosocial changes</li> <li>b) Common nutritional concerns</li> <li>c) Defensive Nutrition paradigm</li> <li>d) Nutritional requirements and dietary recommendation.</li> <li>e) Physical Activity in adulthood</li> </ol>	<b>15</b>
<b>UNIT III</b>	<b>Nutrition in Aging/Elderly</b> <ol style="list-style-type: none"> <li>a) Theories of Aging, Physiological and Psychosocial changes</li> <li>b) The Aging Process</li> <li>c) Nutritional requirements of the Elderly</li> <li>d) Nutrition care</li> </ol> <b>Nutrition needs during illness and chronic conditions</b> <ol style="list-style-type: none"> <li>a) Sensory loss</li> <li>b) Oral health</li> <li>c) GI functions</li> <li>d) Neuromuscular and skeletal functions</li> <li>e) Renal and cardiac function</li> <li>f) Immuno-competence</li> </ol>	<b>15</b>

#### References

- Bennion, H. (1979) *Clinical Nutrition*, New York Harper and Raw Publishers
- Brown, J. E. (1998). *Nutrition Now*, West/Wadsworth: International Thomson Pub. Co.
- Brown, J. E., Sugarman, I. J. (2002). *Nutrition through the Life Cycle*, Wadsworth Thomson Learning.
- Donald, B., MCColmick, Bier, D. M. (1997). *Annual Review of Nutrition* (vol. 19)
- Goodhart, R. S. S. and Shils, M. E. (1998). *Modern Nutrition in Health and Disease*. Philadelphia: Lea and Febiger.
- Groff, J. L and Gropper, S. S. (1999). *Advanced Nutrition and Human Metabolism*, Belmont CA: Wadsworth/Thomson Learning.
- Jackson, M. S., Rees, Jane, M., Golden, Neville, H.; Irwin Charles, E. (ed) (1997). *Adolescent Nutritional Disorders*. New York: The New York Academy of Science.
- Lee, R. S. and Marcus, C. (1990) *Omega – 3 Fatty Acids in Health and Disease*. – Marcel Dekker Inc.
- Mahan L. K. & Stump S.E. (11<sup>th</sup> ed.) (2004) *Krause's Food Nutrition and diet Therapy* – Saunders USA: Elsevier.

Wardlaw, G. M. Insel, P. M. and Seyler M. F. (1994). *Contemporary Nutrition; Issues and Insights* St. Louis Masby.

Warthington, R., Vermeersch J. and Willams, S. (1985). *Nutrition in Pregnancy and Lactation* St. Louis Times Mirror.Mosby College Publishing.

Ziegler, E. E. and Filer L. J. (1996). *Present Knowledge in Nutrition*, Washington D.C.: International Life Science institute.

### **Journals**

Journal of American Dietetic Association USA – The American Dietetics Association.

Nutrition Reviews, New York Springton Verlag

The American – Journal of clinical Nutrition – USA Official Journal of the American Society for Clinical Nutrition Inc

The Indian Journal of Nutrition and Dietetics

Course Code	Title	Periods/week	Marks	Credits
PSHSPIB201	Chemical Analysis of Foods	3	75	3

### CHEMICAL ANALYSIS OF FOODS

No. of Credits: 3

#### 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 Content		Lectures
<b>UNIT I</b>	i. Determination of crude fiber in different foods. ii. Protein estimation in different foods by Kjeldahl method, Lowry's method and Ninhydrin method.	<b>15</b>
<b>UNIT II</b>	i. Crude fat determination by solvent extraction method ii. 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	<b>15</b>
<b>UNIT III</b>	i. Estimation of thiamin content of foods by Fluorimetric method. ii. Estimation of riboflavin content of foods by Fluorimetric method. iii. Estimation of ascorbic acid content of different foods by 2,6 dichloro indophenol method iv. Different chromatographic techniques: Paper chromatography, Thin layer chromatography and HPLC techniques v. Estimation of lycopene in tomatoes vi. Estimation of oxalates from spinach	<b>15</b>

#### References

- Nielsen, Suzanne, S. (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* 8<sup>th</sup> edition longman scientific and Technical, U.K.
- A.O.A.C. (1990) *Official Methods of Analysis* 15<sup>th</sup> ed. Association of official analytical chemists, Washington, D.C.
- Meyer, L.H (1987) *Food Chemistry* CBS Publishers and distributors, Delhi.
- ISI Publications on different foods.
- Pearson, D.(1970) *Chemical Analysis of Foods*, 6<sup>th</sup> ed., London, T.A. Churchill.

Course Code	Title	Periods/week	Marks	Credits
PSHSPIB202	Food Product Development	3	75	3

### FOOD PRODUCT DEVELOPMENT

No. of credits: 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.

Course Content		Periods
<b>UNIT I</b>	Chocolate and confectionery Fruit based snacks Long shelf life snacks High protein snacks/beverages (whey protein) Pickled seafood	<b>15</b>
<b>UNIT II</b>	Business Analysis Marketing Strategy	<b>15</b>
<b>UNIT III</b>	Launching of the product Evaluation of product acceptability on the basis of cost effectiveness and other nutritive parameters through survey	<b>15</b>