

Cover Page

AC 11-03-2016

Item No. 4.18

**UNIVERSITY OF MUMBAI**



**Syllabus for Approval**

Sr. No.	Heading	Particulars
1	Title of the Course	M.Sc (E) Home Science in (i) Foods, Nutrition & Dietetics (iv) Human Development (ii) Food Processing & Preservation (v) Textiles & Fashion Technology (iii) Sports Nutrition
2	Eligibility for Admission	- Please see attached copies -
3	Passing Marks	Theory ] 40% in each component Practicals ]
4	Ordinances / Regulations ( if any)	
5	No. of Years / Semesters	Two Semesters - Sem I, Sem II
6	Level	P.G. / U.G. / Diploma / Certificate ( Strike out which is not applicable)
7	Pattern	Yearly / Semester ( Strike out which is not applicable)
8	Status	New / Revised ( Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year <u>2016-17</u>

Date: 9.3.16

Signature: Geeta Ibrahim

Name of BOS Chairperson / Dean: Dr. Geeta Ibrahim

# **UNIVERSITY OF MUMBAI**



## **Syllabus**

### **SEMESTER I & SEMESTER II**

**Program: M.Sc.**

**Course: Home Science**

**Branch IA: Foods, Nutrition and Dietetics**

(Credit Based Semester and Grading System  
with effect from the academic year 2016–2017)

**M.Sc. (HOME SCIENCE) BRANCH IA : FOODS, NUTRITION AND DIETETICS****SEMESTER I**

<b>Course Code</b>	<b>Title</b>	<b>Theory/ Practical</b>	<b>Internal Marks</b>	<b>Semester End Exam</b>	<b>Total Mark s</b>	<b>Periods/ week</b>	<b>Credits</b>
PSHSI101	Research Methods and Biostatistics – Paper I	Theory	40	60	100	3	4
PSHSIA102	Advances in Nutritional and Clinical Biochemistry - I	Theory	40	60	100	3	4
PSHSIA103	Nutritional Management of Chronic Degenerative Diseases	Theory	40	60	100	3	4
PSHSIA104	Maternal and Child Nutrition	Theory	40	60	100	3	4
PSHSIA105	Food Science and Processing	Theory	40	60	100	3	4
PSHSIAP101	Biochemistry and Food Analysis - I	Practical	---	50	50	4	2
PSHSIAP102	Principles of Food Science	Practical	---	50	50	3	2
	<b>Total</b>		200	400	600	22	24

Course code	Title	Periods/week	Marks	Credits
PSHSI101	<b>RESEARCH METHODS AND BIOSTATISTICS – PAPER I</b>	<b>3</b>	<b>100</b>	<b>4</b>

**Objectives:**

1. To build in students appreciation for high quality research.
2. To introduce students to the skills needed in conducting a research.

Course content		Periods
<b>Unit I</b>	<p>A. An introduction to research methodology:            Definition            Objectives of research            Types of research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. qualitative, Conceptual vs. Empirical            Other types: Cross sectional vs. longitudinal, Field setting or laboratory, clinical or diagnostic, Exploratory, Historical research.            Research approach: Quantitative and qualitative approach            Ethics in research, applying for ethical approval/ clearance            Defining the research problem: Selecting and defining the problem            Literature survey            Formulation of hypothesis</p> <p>B. Research designs:            Need for a research design, features of a good design            Types of research designs- Explorative/ descriptive/ experimental/ Survey/ Case Study</p>	<b>15</b>
<b>Unit II</b>	<p>A. Sampling techniques for nutrition research            Sample design-Criteria of selecting a sampling procedure; Characteristics of a good sampling design            Types of sample designs: Non-probability sampling and Probability sampling            Purposive sampling, Simple random sampling, Systematic sampling, Stratified sampling, Quota sampling, Cluster sampling, Multi-stage sampling, Sequential sampling.            Determination of sample size for different type of research</p> <p>B. Measurement and scaling techniques            Measurement scales: Nominal, Ordinal Interval, Ratio            Validity, Reliability and Practicality            Scaling, scaling techniques - rating scales (paired comparison, rank order), likert scales etc.</p>	<b>15</b>
<b>Unit III</b>	<p>A. Methods/ tools of data collection            Collection of primary data: Observation method, Interview method, Questionnaire method, case study method.            Collection of secondary data            Selection of appropriate method of data collection</p> <p>B. Data processing and management            Processing operations: Editing, coding, classification, tabulation            Use of data entry software</p>	<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.
- Kothari, C.R. (2004). Research Methodology-Methods and Techniques. New Age International Publishers, New Delhi.
- Leong, F.T.L. & Austin, J. T. (Eds.) (1996). The psychology research handbook. New Delhi: Sage

Course code	Title	Periods/week	Marks	Credits
PSHSIA102	<b>ADVANCES IN NUTRITIONAL AND CLINICAL BIOCHEMISTRY - I</b>	<b>3</b>	<b>100</b>	<b>4</b>

Course content		Periods
<b>Unit I</b>	Biomolecules of Nutritional Significance <ol style="list-style-type: none"> <li>Carbohydrates – Oligosaccharides, Polysaccharides, sugar alcohols, Glycosides</li> <li>Proteins – Essential and non-essential amino acids, Formation of specialized products from amino acids and their functions – Glutathione, Creatine – creatinine, biogenic amines (dopamine, norepinephrine, tyranine, serotonin, GABA, histamine). Biologically important peptides (Insulin, ACTH, Oxytocin, Vasopressin, Angiotensin, TRH. Four levels of protein structure and functions of Insulin, Haemoglobin, Carboxypeptidase, Keratin)</li> <li>Lipids – Compound Lipids, Fatty acids, MCT's, Cholesterol, Prostanoids.</li> </ol>	<b>15</b>
<b>Unit II</b>	Cellular Communication – Digestion and absorption of macronutrients <ol style="list-style-type: none"> <li>Cellular transport – Principles of mechanisms of passive, Facilitated diffusion and active transport. Na – K ATPase. Artificial membranes in drug delivery. GLUT proteins</li> <li>Cell signaling – General principles. Signalling via G- proteins embedded cell surface receptors.</li> <li>Gap junctions in extracellular communication</li> <li>Interactions of cells with other cells.</li> <li>Outline of digestion and absorption of carbohydrates, proteins and lipids</li> </ol>	<b>15</b>
<b>Unit III</b>	Enzyme Chemistry and Metabolism of Macronutrients. <ol style="list-style-type: none"> <li>IUB classification of enzymes. Active site and its identification. Factors affecting enzyme activity. Significance of Km</li> <li>Enzyme Inhibition – Clinical enzymology – LDH isoenzymes, SGOT, SGPT, Amylase, Use of ELISA, RIA techniques</li> <li>Carbohydrate Metabolism - Glycolysis, TCA, Gluconeogenesis, Glycogen metabolism, HMP, Uronic acid, Bioenergetics – ETC, Mechanism of phosphorylation, Shuttle pathways</li> <li>Protein metabolism – Decarboxylation, Transamination, Transmethylation, Ammonia formation and detoxification, Urea Cycle. Metabolism of Tyrosin, Phe, Trp, Sulphur containing amino acids, BCAA and related inborn errors of metabolism.</li> <li>Lipid Metabolism – Knoop's Beta oxidation, Fatty acid biosynthesis, cholesterol biosynthesis, ketogenesis.</li> </ol>	<b>15</b>

### References

- Berg, J. M., Tynocrko, J. L. et al *Biochemistry* (5th ed.) New York W.H. Freeman and Co 2002.
- Brody Tom. *Nutritional Biochemistry* 2nd ed. New Delhi Elsevier/Reed Elsevier India Pvt. Ltd. 2004
- Chatterjee M.N. Shinde and Rana *Textbook of Medical Biochemistry* 6th ed. New Delhi Jaypee Brothers Medical Publishers 2005.
- Devlin Thomas, M (ed.) *Textbook of Biochemistry with Clinical Correlation* New York, John Wiley and Sons Inc. 1997.
- Montgomery, Rex and others *Biochemistry A case oriented Approach* St. Louis The C.V. Mosby Co. 1977.
- Murray, R.K. and others. *Harper's Biochemistry* 25th ed. Connecticut, Appleton and large Publications. London, Prentice Hall Int. Inc 1996.
- Lehninger, A.L.; Nelson D.L. and Cox. M.M., *Principles o Biochemistry* 3rd ed. New York. Worth Publishers McMullan Press, 2000
- Puri Dinesh *Textbook of Biochemistry. A Clinically oriented Approach* New Delhi B.I. Churchill Livingstone Pvt.Ltd. 2002.

Course code	Title	Periods/week	Marks	Credits
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PSHSIA103	<b>NUTRITIONAL MANAGEMENT OF CHRONIC DEGENERATIVE DISEASES</b>	<b>3</b>	<b>100</b>	<b>4</b>

**Objectives:**

1. To provide an overview of the Nutrition Intervention protocol and counseling strategies.
2. To provide in depth, research based and advanced knowledge regarding prevalence, etiology, diagnosis, pathophysiology, drug –nutrient and gene –nutrient interactions, and various management and nutrition education strategies.

<b>Course content</b>	<b>Periods</b>
<b>Unit I</b> <b>Nutritional Care Process and Counseling Strategies</b> A. Nutritional Care Process <ul style="list-style-type: none"> <li>• The Nutritional Care process-a detailed study of nutritional assessment, diagnosis, planning and goal setting, intervention ,follow-up and documentation.</li> <li>• Role and skills of a dietitian</li> <li>• Modifications of the Normal Diet</li> <li>• Hospital inpatient nutritional care.</li> <li>• Relevance of research for a Nutritionist/dietitian</li> </ul> B. Detailed study of Nutrition Counseling theories and strategies	<b>15</b>
<b>Unit II</b> <b>Weight Management</b> A. Obesity and overweight <ul style="list-style-type: none"> <li>• Regulation of body weight.</li> <li>• Genetics and body weight.</li> <li>• Etiology, classification, assessment techniques pathophysiology, metabolic effects of obesity with special reference to obesity as an inflammatory disease.</li> <li>• Management Strategies: Nutritional and dietary management, exercise, lifestyle and behavioural changes, medical management and surgical management.</li> <li>• Management of obesity in pregnancy, lactation and childhood.</li> </ul> B. Underweight and eating disorders <ul style="list-style-type: none"> <li>• Underweight: Etiology, metabolic consequences of starvation and management strategies</li> <li>• Eating Disorders: Anorexia Nervosa, Bulimia Nervosa, Binge eating disorder, Eating Disorder not otherwise specifies.</li> </ul>	<b>15</b>
<b>Unit III</b> <b>Type 2 Diabetes Mellitus, Cardiovascular Diseases and Metabolic syndrome</b> A. Type 2 Diabetes Mellitus <ul style="list-style-type: none"> <li>• Etiology, pathophysiology, assessment and complications(Acute and chronic)</li> <li>• The diabetic gut</li> <li>• Medical (OHA and insulin), nutritional and lifestyle management strategies.</li> <li>• Nutrition in exercising diabetic populations</li> </ul> B. Cardiovascular Diseases <ul style="list-style-type: none"> <li>• Atherosclerosis and arteriosclerosis: Etiology, risk factors, diagnosis, pathophysiology and progression, endothelial dysfunction.</li> <li>• Consequences of atherosclerosis: Arterial blockage, Thrombus formation and occlusion, embolism, inflammation</li> <li>• Etiology, Pathophysiology, Diagnosis, assessment and management (Nutritional. Lifestyle ,Medical and surgical) and preventive strategies of :               <ul style="list-style-type: none"> <li>❖ Hypertension</li> <li>❖ Hyperlipidemias</li> <li>❖ Angina Pectoris, Myocardial infarction</li> <li>❖ Congestive Cardiac Failure</li> </ul> </li> </ul>	<b>15</b>

	<p>C. Metabolic Syndrome</p> <ul style="list-style-type: none"> <li>• Prevalence, etiology, risk factors, complications and management</li> <li>• Preventive strategies</li> </ul>	
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### References

- Barrer. K. (2007) *Basic Nutrition Counselling Skill Development*. Wadsworth Pub. Co.
- Bendich. A. (2002) *Preventive Nutrition* Humana Press
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- Gable. J. (2007) *Counselling skills for Dietitians*, Blackwell Publishing House
- Garrow. J.S (1993). *Human Nutrition and Dietetics*, 9th ed., Churchill Livingstone Pub.
- Medeiros D. and Wildman R. (2011). *Advanced Human Nutrition*. Jones & Bartlett Publishers.
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- Mahan.K.L. (2012). *Krause's Food and Nutrition Therapy* Saunders Pub.
- McCormic.D. (1999). *Annual Review of Nutrition* vol 19 &20. Annual Reviews, California.
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- Journals
- American Journal of Clinical Nutrition
- Journal of American Dietetic Association.
- Nutrition Reviews

Course code	Title	Periods/week	Marks	Credits
PSHSIA104	<b>MATERNAL AND CHILD NUTRITION</b>	3	100	4

**Objectives:**

1. To study the influence of nutrition on humans during the different stages of life cycle
2. To emphasize the importance of nutrition in mother and child health
3. To be aware and update the knowledge in the field of nutrition as applied during the life cycle

Course content		Periods
<b>Unit I</b>	<b>I Pre-Conception Nutrition</b> <ul style="list-style-type: none"> <li>• Fetal origins hypothesis, Nutrition related disruptions in fertility, other preconception nutrition concerns e.g PCOS, eating disorders, PMS, Contraception, Diabetes Mellitus etc</li> <li>• Nutrition during Pregnancy – An overview of physiology of pregnancy (normal changes), Fetal development, critical periods of growth and development, pregnancy weight gain, Nutritional requirements during pregnancy (macro and micro nutrients), Dietary supplements, Role of exercise</li> <li>• Common problems associated with pregnancy – Obesity, GDM, PIH, HIV, multi fetal pregnancies</li> </ul>	15
<b>Unit II</b>	<b>II. Nutrition during Lactation and infancy</b> <ul style="list-style-type: none"> <li>• Lactation Physiology – Mammary gland development, Lactogenesis, Let-down reflex, human milk composition, Benefits of breast feeding, Nutrient needs of lactating mother and role of galactogogues</li> <li>• Breast Feeding issues – Common conditions e.g Let-down reflex, position, identifying hunger and satiety, feeding frequency, supplements and maternal medications, Alcohol and other drug exposure</li> <li>• Infant Nutrition – New born growth assessment, infant development – motor, cognitive, GI system, feeding skills, complementary nutrition, nutrition needs of infants.</li> <li>• Common nutritional problems and concerns – FIT, Colic, Anaemia, Caries, Ear infection, Allergies, Neonatal jaundice, premature infant nutrition – preterm, SFD, AGA, LGA, SGA</li> </ul>	15
<b>Unit III</b>	<b>III. Nutritional needs of toddlers and preschoolers, children and preadolescents</b> <ul style="list-style-type: none"> <li>• Child and Pre-adolescent Nutrition Concerns – Undernutrition, overweight, obesity, CVD, hypertension etc.</li> <li>• Nutrition requirements of children with special health care needs e.g SAM, PEM Autism, ADHD, CP, PKU, Galactosemia, Epilepsy</li> <li>• An overview of physical activity guidelines for children</li> </ul>	15

**References**

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- Mahan L. K. & Stump S.E. (11th ed.) (2004) *Krause's Food Nutrition and diet Therapy* – Saunders USA: Elsevier.
- Nelms M., Roth S.L. and Lacey K. (2008). *Medical Nutrition Therapy: A Case Study Approach*. Wadsworth Cengage Learning.
- Wardlawy, G. M. Insel, P. M. and Seyler M. F. (1994). *Contemporary Nutrition; Issues and Insights* St. Lopuis



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Warthinton, 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 Academy of Nutrition and Dietetics

Nutrition Reviews

The American Journal of Clinical Nutrition

Course code	Title	Periods/week	Marks	Credits
PSHSIA105	<b>FOOD SCIENCE, PROCESSING AND PRESERVATION</b>	<b>3</b>	<b>100</b>	<b>4</b>

**Objectives :**

1. To enable understanding of the chemistry of food components, the chemical and biochemical reactions in foods.
2. To impart a systematic knowledge of basic and applied aspects of food processing and technology
3. To enable students to become familiar with the quality and safety of food.

Course content		Periods
<b>Unit I</b>	<p><b>I Principles of Food Science</b></p> <p>a) <b>Water:</b> States of water, water activity, water in food preparation.</p> <p>b) Physical aspects of food preparation: energy and food energy transfer, mass transfer, state of matter, dispersions, emulsions, gels, foams.</p> <p>c) <b>Carbohydrates:</b> Properties of sugars - Hydrolysis, Caramelization, Maillard reaction. Applications of these properties in food processing e.g crystalline candies, syrup, sauces, jams and jellies, <b>Starch:</b> Structure, functional properties - Gelatinization, pasting, syneresis, retrogradation, dextrinization. Factors affecting gelatinization and gelation. Modified and resistant starches, Gums – Functions, sources, applications. Pectic substances, pectin gels</p> <p>e) <b>Proteins</b> – Properties of proteins – Amphoterism, Isoelectric point, Water-binding capacity, hydrolysis, denaturation, Coagulation, Salting in salting out, Gluten complex development, Gelatin gel, modified meat products, soy proteins, texturized vegetable proteins, non-conventional sources of protein.</p> <p>f) <b>Lipids – Properties of Fats</b> crystallinity of solid fats, Polymorphism, Melting points, Plasticity of Fats, chemical degradation, oxidative and hydrolytic rancidity, effect of heat, chemical modifications - Hydrogenation, Interesterification, Winterization, Functional roles of fats - fat replacements.</p>	15
<b>Unit II</b>	<p><b>II. Principles of Food Preservation</b></p> <p><b>General principles of Food preservation:</b> Meaning, mode of action and changes in foods</p> <p>Use of High temperature (Heat preservation) – Moist and Dry heat methods, Blanching, Dehydration, concentration, Canning, commercial sterilization, pasteurization</p> <p>Cold Preservation – Freezing and Refrigeration, Freezing methods – Air freezing, Indirect contact freezing, immersion freezing, dehydro-freezing, Cryo-freezing. Changes in foods during refrigeration and frozen storage</p> <p>Ionizing radiation and microwave heating – Ionizing radiations and sources, units of radiation, radiation effects, mechanism of microwave heating. Application of radiation technology</p> <p>Fermentation – Benefits and mechanisms of fermentation. Fermented food products e.g Beer, Wine, Soya sauce, Cheese, Soya bean products</p> <p>Use of Food Additives an overview – Broad classes, Intentional and unintentional food additives.</p> <p>Food Enzymes and their applications in Food industry. Application of Hurdle Technology</p>	15
<b>Unit III</b>	<p><b>III. Processing Technology of Foods</b></p> <p>a) Cereals &amp; Millets – Milling of cereals &amp; millets, breakfast and fortified cereals, Extrusion technology using cereals and millets.</p> <p>b) Pulses – Processing, elimination of toxic factors soya bean products.</p> <p>c) Oil seeds – oil extraction, purification, fully refined oil, margarine, peanut butter, salad dressings.</p> <p>d) Fruits and vegetables – Changes during ripening storage, dehydrated, canned and frozen vegetables, fruit processing – jams, jellies, marmalades, puree, pastes, powders, beverages, fruit juices</p> <p>e) Milk and Milk products – Milk processing, Milk products, cheese, butter, cream, ghee, milk powder, ice cream concentrated milk, skim milk, lactone, Vit. D milk.</p> <p>f) Eggs - Quality of eggs, deterioration, egg processing – dehydration and freezing, egg</p>	15

	products. g) Poultry processing and Tandoor chicken h) Fish spoilage in fish, canned, dehydrated and frozen, fish meal, fish protein concentrate fish oils. i) Meat – Meat tenderization ageing and curing, sausages. j) Sugar and Jaggery - manufacture of sugar, HFCS Convenience foods & ready to eat foods, Nano Technology	
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## References

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\*\* All new journals related to Food Science and Processing

Course Code	Title	Periods/week	Marks	Credits
PSHSIAP101	<b>FOOD ANALYSIS &amp; BIOCHEMISTRY - I</b>	<b>4</b>	<b>50</b>	<b>2</b>

Course Content		Periods
Unit I	<b>Bioanalytical Chemistry &amp; Enzymology</b> <ol style="list-style-type: none"> <li>Standardization of acids and alkalies</li> <li>Preparation of buffers, indicators and use of pH meter</li> <li>Paper chromatography of amino acids and sugars</li> <li>Isolation, calculation of percent yield of amylase from sweet potato and study of optimum pH, Km</li> <li>Estimation of Acid Phosphatase</li> </ol>	
Unit II	<b>Isolation, Preparation &amp; Extraction</b> <ol style="list-style-type: none"> <li>Casein from milk</li> <li>Cholesterol from egg yolk</li> <li>Lycopene from tomatoes</li> <li>Albumin &amp; globulin from egg whites</li> </ol>	
Unit III	<b>Clinical Analysis (from blood, serum)</b> Estimation of: <ol style="list-style-type: none"> <li>Glucose by Folin- Wu Method, GOD/POD</li> <li>Lipid profile- Triglycerides &amp; cholesterol</li> <li>Protein by Biuret, Fehn-Lowry</li> <li>Estimation of Iron</li> <li>Estimation of Calcium</li> <li>Estimation of phosphorus</li> </ol>	

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- Brave Robert D – Introduction to Instrumental Analysis, McGraw Hill Book Co, New York
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- Feitz – Clinical Chemistry
- Frelfelder D- Physical Biochemistry .Skoog Douglas A – Principles of Instrumental Analysis Harcourt Brace publishers, London
- Gill CV – Short cases in clinical biochemistry, Churchill Livingstone, Edinburgh, 1984
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- Greenberg David M – Metabolic Pathways. Vols. 2 and 3, 3<sup>rd</sup> editions. Academic Press, New York
- Harvey David – Modern Analytical Chemistry, International editi
- Henry Richard et al – Clinical Chemistry, Principles and Techniques, 2<sup>nd</sup> edition, Harper and Row, New York
- Holme David J – Problem solving in analytical biochemistry, H & Longman Sc. And Tech, Essex India Pvt Ltd.
- Jayaram J., (1981) *Laboratory Manual in Biochemistry*, New Delhi: Wiley Eastern Ltd.
- John Bernard Henry, Clinical Diagnosis and Management by Laboratory Methods, Saunders publications, 20<sup>th</sup> edition
- Kamal SH – Clinical Biochemistry for Medical Technologies, Churchill Livingstone, London
- Methods in Enzymology – Kaplan
- Murray Robert – Harper's biochemistry, 24<sup>th</sup> edition, Prentice Hall International UK LTD, 1990
- Nelson DI, Cox MM – Lehninger Principles of Biochemistry
- Ninfa Alexander J and Ballou David P – Fundamental Laboratory Approaches for Biochemistry and Biotechnology, Fitzgerald Science Press, Bethesda on, McGraw, Hill, Boston
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- Practical Biochemistry by David Plummer
- RaoRanganathan – Text book of biochemistry 3<sup>rd</sup> edition, Prentice Hall, New Delhi
- Rodney Boyer Experimental Biochemistry Pearson Publ. Sawheny and Singh
- Rodrigues Fred K Carbohydrate chemistry with clinical correlations, New Age International, New Delhi
- S. Sadasivan and A. Manickam, (2003). *Biochemical Methods*, 2<sup>nd</sup> ed. New Age International (P) Ltd.. Publishers.
- Satyanarayanan – Biochemistry

Srivascava VK and Kishor K – Introduction to chromatography: Theory & Practice, S Chand & Co, New Delhi  
Stokes Joan et al – Clinical Microbiology, Edward Arnold, London  
Todd et al – Clinical Diagnosis and Management, 17<sup>th</sup> edition, WB Saunders, Philadelphia  
Upadhyaya et al – Biophysical Chemistry, Himalaya Publishing Home, New Delhi  
Van Holde KE – Principles of Physical Biochemistry, Prentice Hall, 1998  
Varley, Harold, & others. (1980) *Practical Clinical Biochemistry*. 5<sup>th</sup> Ed. Delhi: CBS Publishers & Distributors.  
Vasudevan Text Book of Medical Biochemistry  
Voet & Voet – Biochemistry, 2<sup>nd</sup> edition  
Wilson K & Walker J – Principles and Techniques of practical Biochemistry. Cambridge Low Price Edition

Course code	Title	Periods/week	Marks	Credits
PSHSIAP102	PRINCIPLES OF FOOD SCIENCE	3	50	2

**Objectives:**

1. To guide the students in their quest for the scientific principles involved in the attainment of food quality.
2. To observe and identify physical and chemical changes underlying the preparation of diverse foods.
3. To understand principles of food science involved in bringing changes in foods.

Course content		Periods
<b>Unit I</b>	<p><b>A. Solutions and Ice crystallization:</b> Effect of formula and procedure on crystal size of frozen deserts</p> <p><b>B. Sugar cookery</b></p> <ol style="list-style-type: none"> <li>i. Tests for stages of sugar cookery</li> <li>ii. Effect of dry heat on sucrose.</li> <li>iii. Crystalline and Non crystalline candies</li> </ol>	15
<b>Unit II</b>	<p><b>A. Cereals and Flours</b></p> <ol style="list-style-type: none"> <li>i. Gelatinization of Starch (different types)</li> <li>ii. Comparison of different cereals for water absorption and consistency</li> <li>iii. Comparison of - different methods of cooking rice, different varieties of rice</li> <li>iv. Starches as thickening agents (potato, corn and other)</li> </ol> <p><b>B. Temporary and Permanent emulsions</b> in Salad Dressings, Effect of Stabilizers and Emulsifiers in salad dressings. Comparisons of low fat and high fat French dressing: Preparation and Comparison of Mayonnaise with variations (with and without egg)</p> <p><b>C. Principles that maintain high quality fried foods</b></p> <ol style="list-style-type: none"> <li>i. Smoke point of different fats and oils</li> <li>ii. Effect of temperature on fat absorption</li> <li>iii. Effect of formulation on fat absorption</li> <li>iv. Effect of coating and binding agents on fat absorption</li> <li>v. Comparison of texture, flavor and mouth-feel of food products using fat substitutes (if available)</li> </ol>	15
<b>Unit III</b>	<p><b>A. Effect of different conditions on properties of proteins</b> e.g. milk</p> <ol style="list-style-type: none"> <li>i. Effect of acids (citric acid, lactic acid and acetic acid) on coagulation of milk proteins</li> <li>ii. Effect of gums on gelation</li> <li>iii. Effect of fat content, pH stabilizers in cream and whipped toppings</li> <li>iv. Difference between natural and processed Cheese</li> </ol> <p><b>B. Examination of properties of egg/meat</b></p> <ol style="list-style-type: none"> <li>i. Denaturation and Coagulation</li> <li>ii. Egg white foams – volume and stability</li> <li>iii. Effect of acid and alkalies on meat/poultry</li> </ol> <p><b>C. Factors affecting gelatin gel</b> - Temperature of liquid, proteolytic enzymes and whipping</p> <p><b>D. Factors affecting vegetable pigments</b> – Temperature, acid, alkalies</p> <p><b>E. Pectin gel:</b> Determination of pectin content, development of a fruit jam, using natural and commercial pectin.</p>	15

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**M.Sc. (HOME SCIENCE) BRANCH IA : FOODS, NUTRITION AND DIETETICS****SEMESTER II**

<b>Course Code</b>	<b>Title</b>	<b>Theory/ Practical</b>	<b>Internal Marks</b>	<b>Semester End Exam</b>	<b>Total Marks</b>	<b>Periods/ week</b>	<b>Credits</b>
PSHSI201	Research Methods and Biostatistics - Paper II	Theory	40	60	100	3	4
PSHSIA202	Advances in Nutritional & Clinical Biochemistry. - II	Theory	40	60	100	3	4
PSHSIA203	Critical Care Nutrition	Theory	40	60	100	3	4
PSHSIA204	Adolescent, Adult and Geriatric Nutrition	Theory	40	60	100	3	4
PSHSIA205	Food Safety and Quality Assurance	Theory	40	60	100	3	4
PSHSIAP201	Biochemistry and Food Analysis - II	Practical	---	50	50	4	2
PSHSIAP202	Development of Food Product	Practical	---	50	50	3	2
	<b>Total</b>		200	400	600	22	24

Course code	Title	Periods/week	Marks	Credits
PSHSI201	<b>RESEARCH METHODS AND BIOSTATISTICS – PAPER II</b>	<b>3</b>	<b>100</b>	<b>4</b>

**Objectives:**

1. To enable in students the skills in selecting, computing, interpreting and reporting statistics.
2. To introduce students to principles of good scientific writing.

Course content		Periods
<b>Unit I</b>	Role of statistics in research Measures of central tendency: Mean, Median, Mode Measures of dispersion: Range, Interquartile range, Variance and Standard Deviation Normal distribution and normal curve Testing of Statistical Hypothesis Type I and Type II errors Guidelines for selecting an appropriate test	<b>15</b>
<b>Unit II</b>	Statistical tests- Applications and interpretation Parametric test of difference- T-test, ANOVA, Post Hoc tests Parametric tests of association- Pearson's correlation coefficient Non parametric tests of difference- Chi-square Regression Analysis Computer applications in analysis of data: Introduction to SPSS- Application of SPSS (Demonstration)	<b>15</b>
<b>Unit III</b>	Interpretation and Presentation of data: Tables- Frequency distributions, Relative Frequency, Graphs- Bar graphs, Histograms, Scatter plots, Line graphs; Pie charts, Pictogram Preparation of research report/ Publication of scientific research articles Information search and data retrieval: Use of internet to extract evidence, Tools for web search/ web search engines, data mining of biological databases	<b>15</b>

**References**

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- Leong, F.T.L., & Austin, J. T. (Eds.) (1996). The Psychology Research Handbook. New Delhi: Sage
- Mahajan B.K. (2010). Methods in Biostatistics for Medical students and Research Workers, Jaypee Brothers Medical Publishers (P) Ltd.
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Course code	Title	Periods/week	Marks	Credits
PSHSIA202	<b>ADVANCES IN NUTRITIONAL AND CLINICAL BIOCHEMISTRY - II</b>	<b>3</b>	<b>100</b>	<b>4</b>

Course content		Periods
<b>UNIT I</b>	Chemistry and Metabolism of Nucleic acids a. Structure, properties and functions of DNA, RNA. Replication, Transcription, Translation in prokaryotes. b. Structure and gene and its organization. Gene regulation. Operon model. c. Mutation – Types, Physical, chemical and biological agents causing mutations. DNA repair mechanism d. Recombinant DNA technique. PCR	<b>15</b>
<b>UNIT II</b>	Overview of Endocrinology and Organ Function Tests a. Classification of Hormones, mechanism of action, synthesis of hormones – Thyroxine, Catecholamines. b. Functions and hyper – hypo states of Thyroid, Insulin, Glucagon. Adrenal, medullary and cortex c. Organ function Tests – LFT, RFT, Gastric	<b>15</b>
<b>UNIT III</b>	Pharmacokinetics, Clinical Research and Ethical Issues a. Pharmacokinetics and drug metabolism, Detoxification phase I and II. b. Fundamental concepts in drug absorption, distribution, metabolism and elimination c. Clinical Trials – Stages I to IV, Clinical Research and its significance , Biomedical ethics in clinical trials	<b>15</b>

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- Brody Tom. *Nutritional Biochemistry* 2nd ed. New Delhi Elsevier/Reed Elsevier India Pvt. Ltd. 2004
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Course code	Title	Periods/week	Marks	Credits
PSHSIA203	NUTRITION IN CRITICAL CARE	3	100	4

**Objectives:**

1. To provide in depth, research based and advanced knowledge regarding the mechanics of and nutrient delivery in enteral and parenteral feeding strategies.
2. To develop an understanding into prevention of critical illness.

Course content	Periods
<p><b>Unit I</b></p> <p><b>Nutrition in the Hypercatabolic State</b></p> <ul style="list-style-type: none"> <li>• Physiological, endocrine, metabolic, inflammatory and nutritional alterations in physiological stress.</li> <li>• Assessment of Nutritional status in the hypercatabolic state.</li> <li>• A study of Etiology ,pathophysiology, diagnosis, assessment and management strategies(pharmacological, surgical and nutritional) in: <ul style="list-style-type: none"> <li>❖ Burns</li> <li>❖ Trauma</li> <li>❖ Surgery</li> <li>❖ Sepsis(SIRS,MODS,)</li> <li>❖ Acute Respiratory Distress and nutritional implications of ventilation,Guillian Barre syndrome</li> </ul> </li> <li>• Drug nutrient interactions</li> </ul>	<b>15</b>
<p><b>Unit II</b></p> <p><b>Nutritional Support</b></p> <p>A. Enteral Nutrition</p> <ul style="list-style-type: none"> <li>• Benefits and indications of enteral nutrition</li> <li>• Timing of initiation of enteral feeding</li> <li>• Routes of Enteral feeding and types of access.</li> <li>• Enteral formulae characteristics(physical and nutritional) and classification</li> <li>• Complications of enteral feeding: Refeeding syndrome, GI complications, and infections, metabolic and mechanical issues.</li> <li>• Advancements in composition and formulations in the enteral feed.</li> <li>• Home enteral nutrition.</li> </ul> <p>B. Parenteral Nutrition</p> <ul style="list-style-type: none"> <li>• Indications and selection of patients for feeding</li> <li>• Parenteral Nutrition access routes and equipments required.</li> <li>• Composition and designing of parenteral formulae</li> <li>• Complications-monitoring and management</li> <li>• Drug Nutrient interactions</li> <li>• Managing home parenteral nutrition.</li> </ul>	<b>15</b>
<p><b>Unit III</b></p> <p><b>Cancer</b></p> <p>Epidemiology of diet and cancer risk  Etiology and molecular basis of cancer  Pathophysiology,metabicalteraltions .inflammatory processes in cancer.  Cancer Cachexia  Diagnosis and assessment of Nutritional Status.  Management strategies in various types of cancers (surgery,chemotherapy, biotherapy, hormonal therapy, radiotherapy, Haematopoeitic Cell Transplant) , their complications and nutritional implications.  Medical Nutrition Therapy and Nutrition Support  Nutrition in the prevention of cancer</p>	<b>15</b>

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- Whitney C. (2006). *Understanding Normal and Clinical Nutrition*. Wadsworth publication
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## Journals

- American Journal of Clinical Nutrition
- Journal of Academy of Nutrition and Dietetics
- Nutrition Reviews
- Journal of Parenteral and Enteral Nutrition.

Course code	Title	Periods/week	Marks	Credits
PSHSIA204	ADOLESCENT, ADULT AND GERIATRIC NUTRITION	3	100	4

**Objectives :**

1. To study the influence of nutrition on humans during the different stages of life cycle
2. To emphasize the importance of nutrition in adolescent, adult and geriatric health
3. To be aware and update the knowledge in the field of nutrition as applied during the life cycle

Course content		Periods
<b>UNIT I</b>	<b>I. Adolescent Nutrition</b> <ul style="list-style-type: none"> <li>• Growth and development, physiological and psychological changes, nutrient requirements (macro and micro)</li> <li>• Concerns with special conditions – Obesity, underweight, pregnancy, substance abuse, eating disorders, deficiencies of calcium and iron, chronic health conditions, sports and athletics</li> </ul>	<b>15</b>
<b>UNIT II</b>	<b>II. Nutrition in Adult Years</b> <ul style="list-style-type: none"> <li>• Physiological and psychological changes, common nutritional concerns, dietary recommendations and nutritional requirements</li> <li>• Physical activity – factors influencing food and nutrient intake</li> <li>• Chronic conditions and defensive health paradigm</li> <li>• Special health concerns of adult woman</li> </ul>	<b>15</b>
<b>UNIT III</b>	<b>III. The Aging Process</b> <ul style="list-style-type: none"> <li>• Physiological, metabolic and body composition changes and its impact on health and nutritional status.</li> <li>• Theories of aging, nutritional risk factors</li> <li>• Nutritional requirements and dietary recommendations, physical activity</li> <li>• Nutrition concerns under special/chronic conditions – heart disease, stroke, hypertension, diabetes mellitus, obesity and underweight, osteoporosis, GI diseases, cognitive disorders.</li> <li>• Promoting fitness and well-being using both modern and traditional approaches</li> </ul>	<b>15</b>

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- Journal of American Dietetic Association USA – The American Dietetics Donald, B., MCColmick, Bier, D. M. (1997). *Annual Review of Nutrition* (vol. 19)
- Nutrition Reviews, New York SpringtonVerlog
- The American – Journal of clinical Nutrition – USA Official Journal of the American

Course code	Title	Periods/week	Marks	Credits
PSHSIA205	FOOD SAFETY AND QUALITY ASSURANCE	3	100	4

#### Objectives:

1. To guide the students in their quest for the scientific principles involved in the attainment of food quality.
2. To observe and identify physical and chemical changes underlying learn about the various ways of evaluating and controlling food quality

Course content		Periods
<b>Unit I</b>	<b>II. Food quality</b> <ul style="list-style-type: none"> <li>• <b>Meanings and definition of food quality</b>, Quality factors in foods, indicators of food quality. Meaning, importance and ways of food quality assessment</li> <li>• <b>Sensory evaluation</b>, physiological bases, sensory characteristics of foods, types, selection and training of sensory panel, requirements of sensory evaluation tests, types of tests, analysis and interpretation of sensory evaluation tests.</li> <li>• <b>Objective evaluation</b> – Basic guidelines, physical methods to evaluate volume, specific gravity, moisture, texture, rheological characteristics, chemical analysis methods, microscopic methods, indices of microbial quality.</li> </ul>	<b>15</b>
<b>Unit II</b>	<b>II. Food Additives and Food Adulterants</b> <ul style="list-style-type: none"> <li>• Brief overview, classification, guidelines for use, MAQ of food additives, toxicological studies, tests to determine safe level – acute test, prolonged test, chronic test.</li> <li>• Food Adulteration – Meaning, detection of common adulterants, PFA laws related to food adulteration.</li> <li>• Food safety, Hazards and risks – Meaning, definition, types of hazards: biological, physical and chemical hazards. Food borne infections and intoxicants</li> <li>• Natural toxicants in foods, pesticides residues in foods. Assessment and elimination investigation of food borne disease outbreak.</li> </ul>	<b>15</b>
<b>Unit III</b>	<b>III. Hygiene, Sanitation and Control of Food quality</b> <ul style="list-style-type: none"> <li>• Principles of food hygiene, personal hygiene, kitchen hygiene and sanitation.</li> <li>• Microbiology in food plant sanitation. Water quality assessment, insect and pest control, waste treatment and disposal, food vending and packaging standards, employees health</li> <li>• <b>Control of Food quality</b> – Principles of quality control. Government regulations (Food laws, orders) and amendments and national and international standards – ISI, AGMARK, FPO, Codex Alimentarius, ISO, FSSAI</li> <li>• Role of FDA and Consumer Guidance Society in India.</li> <li>• <b>Management systems in food quality control. HACCP, TQM and concept of food audits</b></li> </ul>	<b>15</b>

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\*\* All new journals related to Food Science and Processing

Course Code	Title	Periods/week	Marks	Credits
PSHSIAP201	FOOD ANALYSIS & BIOCHEMISTRY - II	4	50	2

Course Content		Periods
<b>Unit I</b>	<b>Bioanalytical Chemistry &amp; Enzymology</b> a. TLC of oils. Separation of pigments – chlorophyll, carotene, Anthocyanin. b. Agarose gel electrophoresis for separation of serum proteins c. Assay of Aspirin- preparation of Aspirin from salicylic acid and its estimation d. Estimation of sodium benzoate from jam	<b>15</b>
<b>Unit II</b>	<b>Isolation, Preparation &amp; Extraction</b> a. Starch from potato b. Pectin from apples/oranges c. Essential oils from orange peels d. Curcumin from turmeric e. Isolation of DNA from Onion skin and Germinated Moong	<b>15</b>
<b>Unit III</b>	<b>Chemical Analysis (Blood/serum/urine)</b> A. Renal Function Tests a. Urea & Creatinine clearance b. Urine Report- abnormal constituents c. BUN- Caraway Method d. Creatinine- Jaffe's method B. Liver Function Tests a. SGOT, SGPT b. Alakaline Phosphatase c. Total & direct bilirubin	<b>15</b>

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 Brave Robert D – Introduction to Instrumental Analysis, McGraw Hill Book Co, New York  
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Wilson K & Walker J – Principles and Techniques of practical Biochemisty. Cambridge Low Price Edition

Course code	Title	Periods/week	Marks	Credits
PSHSIAP202	DEVELOPMENT OF FOOD PRODUCT	3	50	2

**Objectives:**

1. To apply principles of food science in development of innovative product.
2. Use of functional foods, novel (less utilized) ingredients in development of products.
3. To identify a suitable packaging label and storage conditions for a developed product.
4. To learn and apply principles of sensory evaluation.

Course content		Periods
<b>Unit I</b>	<b>Sensory evaluation of foods</b> i. Threshold concentrations of primary tastes. ii. Effect of Temperature on taste. iii. Identification of samples through Difference, Descriptive and Affective testing <b>Generation of idea and evaluation of sensory quality</b> i. Concept development and testing ii. Product development iii. Determination of sensory evaluation methods for evaluating quality iv. Developing score card as an evaluation tool v. Report writing	<b>15</b>
<b>Unit II</b>	Food Product Formulation i. Enhancement of nutritive value, waste utilization, cost effectiveness, value addition of anyone of the product categories given – Ready to eat breakfast cereals, yoghurt beverage, salad dressing, low fat/low calorie/high fibre products; Desserts using artificial/low calorie sweeteners ii. Traditional Indian recipes	<b>15</b>
<b>Unit III</b>	Identifying suitable packaging material, shelf life studies in various altered conditions	<b>15</b>

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