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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(I) Home Science in (i) Foods, Nutrition & Dietetics (ii) Food Processing & Preservation (iii) Sports Nutrition (iv) Human Development (v) Textile & Fashion Technology
2	Eligibility for Admission	- Please see attached copies -
3	Passing Marks	Theory, Practicals] 40% in each component
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 2016-17

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

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods/ week	Credits
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
	Total		200	400	600	22	24

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

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
Unit I	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 B. Research designs: Need for a research design, features of a good design Types of research designs- Explorative/ descriptive/ experimental/ Survey/ Case Study	**15**
Unit II	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 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.	**15**
Unit III	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 B. Data processing and management Processing operations: Editing, coding, classification, tabulation Use of data entry software	**15**

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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	**ADVANCES IN NUTRITIONAL AND CLINICAL BIOCHEMISTRY - I**	**3**	**100**	**4**

Course content		Periods
Unit I	Biomolecules of Nutritional Significance a. Carbohydrates – Oligosaccharides, Polysaccharides, sugar alcohols, Glycosides b. 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) c. Lipids – Compound Lipids, Fatty acids, MCT's, Cholesterol, Prostanoids.	**15**
Unit II	Cellular Communication – Digestion and absorption of macronutrients a. Cellular transport – Principles of mechanisms of passive, Facilitated diffusion and active transport. Na – K ATPase. Artificail membranes in drug delivery. GLUT proteins b. Cell signaling – General principles. Signalling via G- proteins embedded cell surface receptors. c. Gap junctions in extracellular communication d. Interactions of cells with other cells. e. Outline of digestion and absorption of carbohydrates, proteins and lipids	**15**
Unit III	Enzyme Chemistry and Metabolism of Macronutrients. a. IUB classification of enzymes. Active site and its identification. Factors affecting enzyme activity. Significance of Km b. Enzyme Inhibition – Clinical enzymology – LDH isoenzymes, SGOT, SGPT, Amylase, Use of ELISA, RIA techniques c. Carbohydrate Metabolism - Glycolysis, TCA, Gluconeogenesis, Glycogen metabolism, HMP, Uronic acid, Bioenergetics – ETC, Mechanism of phosphorylation, Shuttle pathways d. 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. e. Lipid Metabolism – Knoop's Beta oxidation, Fatty acid biosynthesis, cholesterol biosynthesis, ketogenesis.	**15**

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Chatterjee M.N. Shinde and Rana*Textbook of Medical Biochemistry* 6th ed. New Delhi Jaypee Brothers MedicalPublishers 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 PublishersMcMullan 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

PSHSIA103	**NUTRITIONAL MANAGEMENT OF CHRONIC DEGENERATIVE DISEASES**	**3**	**100**	**4**

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.

Course content		**Periods**
Unit I	**Nutritional Care Process and Counseling Strategies** A. Nutritional Care Process • The Nutritional Care process-a detailed study of nutritional assessment, diagnosis, planning and goal setting, intervention ,follow-up and documentation. • Role and skills of a dietitian • Modifications of the Normal Diet • Hospital inpatient nutritional care. • Relevance of research for a Nutritionist/dietitian B. Detailed study of Nutrition Counseling theories and strategies	**15**
Unit II	**Weight Management** A. Obesity and overweight • Regulation of body weight. • Genetics and body weight. • Etiology, classification, assessment techniques pathophysiology, metabolic effects of obesity with special reference to obesity as an inflammatory disease. • Management Strategies: Nutritional and dietary management, exercise, lifestyle and behavioural changes, medical management and surgical management. • Management of obesity in pregnancy, lactation and childhood. B. Underweight and eating disorders • Underweight: Etiology, metabolic consequences of starvation and management strategies • Eating Disorders: Anorexia Nervosa, Bulimia Nervosa, Binge eating disorder, Eating Disorder not otherwise specifies.	**15**
Unit III	**Type 2 Diabetes Mellitus, Cardiovascular Diseases and Metabolic syndrome** A. Type 2 Diabetes Mellitus • Etiology, pathophysiology, assessment and complications(Acute and chronic) • The diabetic gut • Medical (OHA and insulin), nutritional and lifestyle management strategies. • Nutrition in exercising diabetic populations B. Cardiovascular Diseases • Atherosclerosis and arteriosclerosis: Etiology, risk factors, diagnosis, pathophysiology and progression, endothelial dysfunction. • Consequences of atherosclerosis: Arterial blockage, Thrombus formation and occlusion, embolism, inflammation • Etiology, Pathophysiology, Diagnosis, assessment and management (Nutritional. Lifestyle ,Medical and surgical) and preventive strategies of : ❖ Hypertension ❖ Hyperlipidemias ❖ Angina Pectoris, Myocardial infarction ❖ Congestive Cardiac Failure	**15**

	C. Metabolic Syndrome • Prevalence, etiology, risk factors, complications and management • Preventive strategies	

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Jeejeebhoy et al. (1988). *Nutrition and Metabolism in Patient Care* W. B. Saunders CO.
Joel B. Mason. (2003). Biomarkers of Nutrient Exposure and Status in One-Carbon (Methyl) Metabolism1.Journal of Nutrition 2003.pdf. jn.nutrition.org/content/132/12/3563.
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Lee. R.D. (2003*). Nutritional Assessment* 3rd ed. M c Graw Hill Pub.
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.
Peckenpaugh.N. (2003*) Nutrition Essentials and Diet Therapy*. 9th ed. Saunders Pub Co.
Sauberlich .H (1999). *Laboratory Tests for the Assessment of Nutritional Status* 2nd ed. CRC Press
Shills. M. (2006). *Modern Nutrition in Health and Disease*.10th ed. Lippincot William and Wilkins.
Whitney.C. (2006). *Understanding Normal and Clinical Nutrition*. Wadsworth publication
Journals
American Journal of Clinical Nutrition
Journal of American Dietetic Association.
Nutrition Reviews

Course code	Title	Periods/week	Marks	Credits
PSHSIA104	**MATERNAL AND CHILD 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 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
Unit I	**I Pre-Conception Nutrition** • Fetal origins hypothesis, Nutrition related disruptions in fertility, other preconception nutrition concerns e.g PCOS, eating disorders, PMS, Contraception, Diabetes Mellitus etc • 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 • Common problems associated with pregnancy – Obesity, GDM, PIH, HIV, multi fetal pregnancies	**15**
Unit II	**II. Nutrition during Lactation and infancy** • 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 • 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 • Infant Nutrition – New born growth assessment, infant development – motor, cognitive, GI system, feeding skills, complementary nutrition, nutrition needs of infants. • Common nutritional problems and concerns – FIT, Colic, Anaemia, Caries, Ear infection, Allergies, Neonatal jaundice, premature infant nutrition – preterm, SFD, AGA, LGA, SGA	**15**
Unit III	**III. Nutritional needs of toddlers and preschoolers, children and preadolescents** • Child and Pre-adolescent Nutrition Concerns – Undernutrition, overweight, obesity, CVD, hypertension etc. • Nutrition requirements of children with special health care needs e.g SAM, PEM Autism, ADHD, CP, PKU, Galactosemia, Epilepsy • An overview of physical activity guidelines for children	**15**

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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	**FOOD SCIENCE, PROCESSING AND PRESERVATION**	**3**	**100**	**4**

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
Unit I	**I`Principles of Food Science** a) **Water:** States of water, water activity, water in food preparation. b) Physical aspects of food preparation: energy and food energy transfer, mass transfer, state of matter, dispersions, emulsions, gels, foams. c) **Carbohydrates**: Properties of sugars - Hydrolysis, Caramelization, Maillard reaction. Applications of these properties in food processing e.g crystalline candies, syrup, sauces, jams and jellies, **Starch**: 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 e) **Proteins** – 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. f) **Lipids – Properties of Fats** 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.	15
Unit II	**II. Principles of Food Preservation** **General principles of Food preservation:** Meaning, mode of action and changes in foods Use of High temperature (Heat preservation) – Moist and Dry heat methods, Blanching, Dehydration, concentration, Canning, commercial sterilization, pasteurization 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 Ionizing radiation and microwave heating – Ionizing radiations and sources, units of radiation, radiation effects, mechanism of microwave heating. Application of radiation technology Fermentation – Benefits and mechanisms of fermentation. Fermented food products e.g Beer, Wine, Soya sauce, Cheese, Soya bean products Use of Food Additives an overview – Broad classes, Intentional and unintentional food additives. Food Enzymes and their applications in Food industry. Application of Hurdle Technology	15
Unit III	**III. Processing Technology of Foods** a) Cereals & Millets – Milling of cereals & millets, breakfast and fortified cereals, Extrusion technology using cereals and millets. b) Pulses – Processing, elimination of toxic factors soya bean products. c) Oil seeds – oil extraction, purification, fully refined oil, margarine, peanut butter, salad dressings. d) Fruits and vegetables – Changes during ripening storage, dehydrated, canned and frozen vegetables, fruit processing – jams, jellies, marmalades, puree, pastes, powders, beverages, fruit juices 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. f) Eggs - Quality of eggs, deterioration, egg processing – dehydration and freezing, egg	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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McWilliams, M (2007). *Foods:Experimental Perspectives* 5th Ed, New Jersey: Macmillar Publishing Co.

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

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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.

Vacklavick, V. and Christian, E. (2003). *Essentials of Food Science.* New York: Kluwer Academic/ Plenum Publisher.

** All new journals related to Food Science and Processing

Course Code	Title	Periods/week	Marks	Credits
PSHSIAP101	**FOOD ANALYSIS & BIOCHEMISTRY - I**	**4**	**50**	**2**

Course Content		**Periods**
Unit I	**Bioanalytical Chemistry & Enzymology** a. Standardization of acids and alkalies b. Preparation of buffers, indicators and use of pH meter c. Paper chromatography of amino acids and sugars d. Isolation, calculation of percent yield of amylase from sweet potato and study of optimum pH, Km e. Estimation of Acid Phosphatase	
Unit II	**Isolation, Preparation & Extraction** a. Casein from milk b. Cholesterol from egg yolk c. Lycopene from tomatoes d. Albumin & globulin from egg whites	
Unit III	**Clinical Analysis (from blood, serum)** Estimation of: a. Glucose by Folin- Wu Method, GOD/POD b. Lipid profile- Triglycerides & cholesterol c. Protein by Biuret, Fehn-Lowry d. Estimation of Iron e. Estimation of Calcium f. Estimation of phosphorus	

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Vasudevan Text Book of Medical Biochemistry
Voet&Voet – Biochemistry, 2nd edition
Wilson K & Walker J – Principles and Techniques of practical Biochemisty. Cambridge Low Price Edition
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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
Unit I	**A. Solutions and Ice crystallization**: Effect of formula and procedure on crystal size of frozen deserts **B. Sugar cookery** i. Tests for stages of sugar cookery ii. Effect of dry heat on sucrose. iii. Crystalline and Non crystalline candies	15
Unit II	**A. Cereals and Flours** i. Gelatinization of Starch (different types) ii. Comparison of different cereals for water absorption and consistency iii. Comparison of - different methods of cooking rice, different varieties of rice iv. Starches as thickening agents (potato, corn and other) **B. Temporary and Permanent emulsions** 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) **C. Principles that maintain high quality fried foods** i. Smoke point of different fats and oils ii. Effect of temperature on fat absorption iii. Effect of formulation on fat absorption iv. Effect of coating and binding agents on fat absorption v. Comparison of texture, flavor and mouth-feel of food products using fat substitutes (if available)	15
Unit III	**A. Effect of different conditions on properties of proteins** e.g. milk i. Effect of acids (citric acid, lactic acid and acetic acid) on coagulation of milk proteins ii. Effect of gums on gelation iii. Effect of fat content, pH stabilizers in cream and whipped toppings iv. Difference between natural and processed Cheese **B. Examination of properties of egg/meat** i. Denaturation and Coagulation ii. Egg white foams – volume and stability iii. Effect of acid and alkalies on meat/poultry **C. Factors affecting gelatin gel** - Temperature of liquid, proteolytic enzymes and whipping **D. Factors affecting vegetable pigments** – Temperature, acid, alkalies **E. Pectin gel**: Determination of pectin content, development of a fruit jam, using natural and commercial pectin.	15

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

SEMESTER II

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods/ week	Credits
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
	Total		200	400	600	22	24

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

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
Unit I	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	**15**
Unit II	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)	**15**
Unit III	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	**15**

References

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Dwiwedi, R. S. (1997). Research Methods in Behavioral Sciences. Delhi: Macmillan India.

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Course code	Title	Periods/week	Marks	Credits
PSHSIA202	**ADVANCES IN NUTRITIONAL AND CLINICAL BIOCHEMISTRY - II**	**3**	**100**	**4**

Course content		Periods
UNIT I	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	**15**
UNIT II	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	**15**
UNIT III	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	**15**

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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
Unit I	**Nutrition in the Hypercatabolic State** • Physiological, endocrine, metabolic, inflammatory and nutritional alterations in physiological stress. • Assessment of Nutritional status in the hypercatabolic state. • A study of Etiology ,pathophysiology, diagnosis, assessment and management strategies(pharmacological, surgical and nutritional) in: ❖ Burns ❖ Trauma ❖ Surgery ❖ Sepsis(SIRS,MODS,) ❖ Acute Respiratory Distress and nutritional implications of ventilation,Guillian Barre syndrome • Drug nutrient interactions	**15**
Unit II	**Nutritional Support** A. Enteral Nutrition • Benefits and indications of enteral nutrition • Timing of initiation of enteral feeding • Routes of Enteral feeding and types of access. • Enteral formulae characteristics(physical and nutritional) and classification • Complications of enteral feeding: Refeeding syndrome, GI complications, and infections, metabolic and mechanical issues. • Advancements in composition and formulations in the enteral feed. • Home enteral nutrition. B. Parenteral Nutrition • Indications and selection of patients for feeding • Parenteral Nutrition access routes and equipments required. • Composition and designing of parenteral formulae • Complications-monitoring and management • Drug Nutrient interactions • Managing home parenteral nutrition.	**15**
Unit III	**Cancer** Epidemiology of diet and cancer risk Etiology and molecular basis of cancer Pathophysiology,metabolicalteraltions .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	**15**

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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
UNIT I	**I. Adolescent Nutrition** • Growth and development, physiological and psychological changes, nutrient requirements (macro and micro) • Concerns with special conditions – Obesity, underweight, pregnancy, substance abuse, eating disorders, deficiencies of calcium and iron, chronic health conditions, sports and athletics	**15**
UNIT II	**II. Nutrition in Adult Years** • Physiological and psychological changes, common nutritional concerns, dietary recommendations and nutritional requirements • Physical activity – factors influencing food and nutrient intake • Chronic conditions and defensive health paradigm • Special health concerns of adult woman	**15**
UNIT III	**III. The Aging Process** • Physiological, metabolic and body composition changes and its impact on health and nutritional status. • Theories of aging, nutritional risk factors • Nutritional requirements and dietary recommendations, physical activity • Nutrition concerns under special/chronic conditions – heart disease, stroke, hypertension, diabetes mellitus, obesity and underweight, osteoporosis, GI diseases, cognitive disorders. • Promoting fitness and well-being using both modern and traditional approaches	**15**

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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
Unit I	**II. Food quality** • **Meanings and definition of food quality**, Quality factors in foods, indicators of food quality. Meaning, importance and ways of food quality assessment • **Sensory evaluation**, 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. • **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 II	**II. Food Additives and Food Adulterants** • Brief overview, classification, guidelines for use, MAQ of food additives, toxicological studies, tests to determine safe level – acute test, prolonged test, chronic test. • Food Adulteration – Meaning, detection of common adulterants, PFA laws related to food adulteration. • Food safety, Hazards and risks – Meaning, definition, types of hazards: biological, physical and chemical hazards. Food borne infections and intoxicants • Natural toxicants in foods, pesticides residues in foods. Assessment and elimination investigation of food borne disease outbreak.	**15**
Unit III	**III. Hygiene, Sanitation and Control of Food quality** • 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, employees health • **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, FSSAI • Role of FDA and Consumer Guidance Society in India. • **Management systems in food quality control. HACCP, TQM and concept of food audits**	**15**

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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
Unit I	**Bioanalytical Chemistry & Enzymology** 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	**15**
Unit II	**Isolation, Preparation & Extraction** 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	**15**
Unit III	**Chemical Analysis (Blood/serum/urine)** 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	**15**

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Practical Biochemistry by David Plummer
RaoRanganathan – Text book of biochemistry 3rd edition, Prentice Hall, New Delhi
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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
Unit I	**Sensory evaluation of foods** i. Threshold concentrations of primary tastes. ii. Effect of Temperature on taste. iii. Identification of samples through Difference, Descriptive and Affective testing **Generation of idea and evaluation of sensory quality** 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	**15**
Unit II	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	**15**
Unit III	Identifying suitable packaging material, shelf life studies in various altered conditions	**15**

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UNIVERSITY OF MUMBAI

Syllabus

SEMESTER I & SEMESTER II

Program: M.Sc.

Course: Home Science

Branch IB: Food Processing & Preservation

(Credit Based Semester and Grading System

with effect from the academic year 2016–2017)

M.Sc. (HOME SCIENCE) BRANCH IB : FOODS PROCESSING AND PRESERVATION

SEMESTER I

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods/ week	Credits
PSHSI101	Research Methods and Biostatistics - Paper I	Theory	40	60	100	3	4
PSHSIB102	Food Chemistry	Theory	40	60	100	3	4
PSHSIB103	Advances in Food Science	Theory	40	60	100	3	4
PSHSIB104	Advanced Food Microbiology	Theory	40	60	100	3	4
PSHSIB105	Nutrition and Biochemistry	Theory	40	60	100	3	4
PSHSIBP101	Food Science	Practical	-	50	50	3	2
PSHSIBP102	Analytical Food Chemistry - I	Practical	-	50	50	3	2
	Total				600	21	24

Course code	Title	Periods/week	Marks	Credits
PSHSI101	**RESEARCH METHODS AND BIOSTATISTICS- PAPER I**	**3**	**100**	**4**

Objectives:

1. To inculcate knowledge about essentials of high quality research.
2. To introduce students to the skills needed in conducting a research.

Course content		Periods
Unit I	A. **An introduction to research methodology**: -Definition, Objectives of research **Types of research** a) Descriptive vs. Analytical b) Applied vs. Fundamental c) Quantitative vs. qualitative d) Conceptual vs. Empirical **Other types:** a) Cross sectional vs. longitudinal b) Field setting or laboratory c) Clinical or diagnostic d) Exploratory Research e) Historical research. B. **Research approach**: Quantitative and qualitative approach C. **Ethics in research:** a) Applying for ethical approval/ clearance b) Defining the research problem: Selecting and defining the problem D. **Literature review** E. **Formulation of hypothesis** F. **Research designs:** a) Need for a research design, features of a good design b) Types of research designs- Explorative/ descriptive/ experimental/ Survey/ Case Study	**15**
Unit II	**A. Sampling techniques for nutrition research** a) Sample design-Criteria of selecting a sampling procedure b) Characteristics of a good sampling design c) Types of sample designs: -Non-probability sampling -Probability sampling -Purposive sampling -Simple random sampling -Systematic sampling -Stratified sampling -Quota sampling -Cluster sampling - Multi-stage sampling -Sequential sampling. d) Determination of sample size for different type of research **B. Measurement and scaling techniques** a) Measurement scales: Nominal, Ordinal Interval, Ratio b) Validity c) Reliability and Practicality d) Scaling, scaling techniques e) Rating scales (paired comparison, rank order), likert scales etc.	**15**
Unit III	**A. Methods/ tools of data collection** a) Collection of primary data: Observation method, Interview method, Questionnaire method, case study method. b) Collection of secondary data c) Selection of appropriate method of data collection	**15**

	B. Data processing and management a) Processing operations: Editing, coding, classification, tabulation b) Use of data entry software (MS Excel & SPSS)	

References

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Course code	Title	Periods/week	Marks	Credits
PSHSIB102	**FOOD CHEMISTRY**	**3**	**100**	**4**

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 chemistry

Course content		Periods
Unit I	**Major Food Components** **A. Water:** a) Chemistry of water, b) Physical properties: specific heat, latent heat, vapor pressure, boiling point, c) water as dispersing medium, states of water, water activity, d) Water in food preparation and preservation, practical applications in industry. **B. Carbohydrates**: a) Carbohydrate chemistry – Monosaccharides, disaccharides, polysaccharides, isomerization, ring structures. Properties of sugars - Hydrolysis, Caramelization, Maillard reaction. b) **Starch:** Structure, functional properties - Gelatinization, pasting, syneresis, retrogradation, dextrinization. Factors affecting gelatinization and gelation. Modified and resistant starches, c) **Gums** – Functions, sources, applications. d) Pectic substances, pectin gels **C. Proteins** – a) Protein chemistry **–** Amino acids, protein structure, classification of proteins b) Properties of proteins – Amphoterism, Isoelectric point, Water-binding capacity, hydrolysis, denaturation, Coagulation, Salting in, salting out, Gluten complex development, Gelation, texturization (spun and extruded textures) , D. **Lipids** a) Lipid chemistry - Structure and composition of fats, fatty acids**,** b) Properties of Fats: crystallinity of solid fats, Polymorphism, Melting points, Plasticity of Fats, chemical degradation, oxidative and hydrolytic rancidity, effect of heat, chemical modifications c) Hydrogenation, Interesterification, Winterization d) Functional roles of fats - fat replacements. **E. Enzymes** a) Biocatalysts, enzyme specificity b) Use of exogenous enzymes in foods – amylases, lipases, proteases c) Endogenous enzymes – phenol oxidases, peroxidases, oxido-reductases, lipoxygenases d) Factors affecting enzyme activity	**15**
Unit II	**Minor Food Components** **A. Vitamins** a) Fat soluble (vitamin A, D, E & K) & water soluble (Vitamins of B-complex & vitamin C)- sources, Bio-availability, losses and stability metabolic role, RDA, deficiency & excess consumption b) Fat soluble vitamins – A, D, E and K – structure, general properties and functions	**15**

	c) Water soluble vitamins – C and B- complex – structure, general properties and functions **B. Minerals** a) Principles of Mineral Chemistry, stability, toxicity, Dietary recommendations, bioavailability**,** General causes of losses and variations in mineral content of food b) Sodium and Potassium replacers/substitutes c) Food fortification and enrichment	
Unit III	**Flavours, Pigments and Food Additives** **A. Flavours** a) Molecular mechanism of flavor perception (sweet, bitter, salty, sour, umami, kokumi, pungent, cooling and astringent) b) Flavours from vegetables, fruits, spices, fats and oils, milk and meat products **B. Pigments** a) Pigments in Animal and Plant tissues (Haeme compounds, Chlorophyll, Carotenoids, Anthocyanins, Betalins) b) Synthetic Food Colors (toxicity and regulatory aspects) **C. Additives** a) Buffer systems and salts, chelating agents b) Antioxidants c) Antimicrobials d) Fat replacers, sweeteners e) Masticatory substances f) Firming texturizers g) Clarifying agents, bleaching agents h) Flour improvers, anti-caking agents, i) Gases and propellants.	**15**

References

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Course code	Title	Periods/week	Marks	Credits
PSHSIB103	**ADVANCES IN FOOD SCIENCE**	**3**	**100**	**4**

Objectives:

1. To learn fundamental concepts and recent advances in food science.
2. To learn industrial application of food science in food product development.

Course content		Periods
Unit I	**Introduction** Role of food scientists, Scope of food science in the area of changing consumer trends (unprocessed, organic) **Cereal and Cereal Products, Fruits and Vegetables** **A. Cereal grains** a) Structure and Chemical composition b) Flours, cooking cereals, breakfast cereals c) Gluten, classes of batters and doughs, leavening process in baked products d) Effect of food processing on nutrient **B. Fruits and Vegetables** a) Structure and Chemical composition b) Physiochemical changes during, harvesting, post-harvesting, ripening, cooking, storage c) Organically grown fruits and vegetables d) Effect of food processing on nutrient	**15**
Unit II	**Milk and milk products, meat, fish and poultry, eggs, pulses** **A. Milk and milk products** a) Structure and Chemical composition b) Milk components as Food ingredients (Lipid phase, protein micelles, milk salt system, whey proteins, lactose) c) Use of milk in formulated foods d) Effect of food processing on nutrients **B. Meat, fish, and Poultry** a) Structure and functions of muscles b) Conversion of Muscle to meat (Rigor Mortis, Ageing, Tenderizing) c) Natural and Induced post-mortem biochemical changes (cold shortening, thaw rigor, electrical stimulation) d) Fish – composition, spoilage e) Eggs- structure and composition, Cooking changes, effect of added ingredients on coagulation f) Effect of food processing on nutrients **C. Pulses** a) Structure and composition, anti-nutritional factors in pulses b) Texturized vegetable proteins, soy isolates, beverages c) Effect of food processing on nutrient	**15**
Unit III	**Fats and Oils, Sugars sweeteners and Confectioners** **A. Fats and Oils** a) Structure, function and composition b) Functional properties of fats used in food industry c) Changes while cooking, d) Fat substitutes e) Effect of food processing on nutrient **B. Sugars, Sweeteners and Confections** a) Role of sugars in food systems b) Types of sugars and sugar syrups c) Sugar based and cocoa based confections d) Effect of food processing on nutrients	**15**

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** All new journals related to Food Science**

Course code	Title	Periods/week	Marks	Credits
PSHSIB104	**ADVANCED FOOD MICROBIOLOGY**	**3**	**100**	**4**

Objectives:

1. Develop an advanced understanding of microbiological issues associated with the food continuum.
2. Develop an understanding of the physiological processes by which microorganisms use to survive food processing interventions
3. Develop familiarity with organisms identified as leading causes of food borne disease.

Course content		Periods
Unit I	**A. Review of Food Microbiology basics** a) Taxonomy, Characterization, classification and identification of microorganisms b) Role of microorganisms and microbial enzymes in food industry c) Microbial flora in common food groups (cereals, pulses, milk and milk products, meat, poultry, fish, eggs, vegetables, fruits, sugars and fats) **B. Microbial Ecology of Foods-Foods as ecosystems** a) Factors affecting microbial growth and control in foods: intrinsic factors, extrinsic factors, implicit factors b) Effect of environment on microbial growth (temperature, water activity, pH, anti-septic/disinfectant)	**15**
Unit II	**A. Food borne illnesses** a) Produce as a source of food borne disease b) Microbial survival in the food chain c) Antimicrobial resistance in the food supply d) Food borne pathogen reservoirs, pre/post-harvest control, and microbiological quality of food Epidemiology and etiology of food borne disease (infection and intoxications) **B. Biofilms in food systems** a) Cell signalling and quorum sensing b) Biofilm development c) Biofilms in food systems d) Role of quorum sensing in biofilm development Identification and control of biofilms in food processing facilities	**15**
Unit III	**A. Microbial Food safety and quality control** a) Food microbiology/safety history, disease, trends and emerging pathogens b) New and emerging technologies for the reduction of pathogenic and spoilage organisms in food c) Food production plant sanitation, hygiene practices and the role of genotyping d) Conventional and rapid methods of food analysis -Limitations of classical methods -Rapid microbiological methods (RMM): manual, semi-automated and automated -Genetics-based diagnostic and identification systems (gene probes and PCR) - Predictive microbiology models and microbial risk assessment	**15**

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Journals: Applied and Environmental Microbiology; Comprehensive Reviews in Food Science and Food Safety; International Journal of Food Microbiology; Food Control; Food Microbiology; Journal of Applied Microbiology; Journal of Food Protection; Journal of Food Science
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Course code	Title	Periods/week	Marks	Credits
PSHSIB105	**NUTRITION AND BIOCHEMISTRY**	**3**	**100**	**4**

Objectives:

1. To acquire knowledge and understanding of biochemistry principles applied in human nutrition
2. To learn the physiologic and metabolic role of macronutrients and micronutrients
3. To understand the utilisation of nutrients from various food sources and its implications in optimal nutrition and health
4. To estimate the contribution of nutrient profile of processed food in meeting required dietary recommendation

Course content		Periods
Unit I	**A. Introduction to cell structure** a) Cell membrane b) Transport mechanisms across cell membrane (diffusion, osmosis, facilitated diffusion & active transport) c) Electron transport chain: Oxidative phosphorylation, role of high energy phosphates **B. Energy** a) Units of energy b) Law of thermodynamics c) Assessment of energy requirements (Direct and indirect calorimeter) d) Components of energy expenditure e) Energy utilisation by the cells f) Energy balance (Hunger, appetite & satiety, calorie density of food) g) Recommended Dietary Allowances **C. Water** a) Fluid compartments in the body, fluid balance, role of water in human nutrition b) Dehydration; commercial rehydration solutions	**15**
Unit II	**A. Carbohydrates** a) Classification, food sources, functions b) Carbohydrates of industrial importance, c) Digestion (Process of digestion, resistant starch, rapidly digestible starch), absorption & transport. d) Metabolism of carbohydrates (brief outline of various pathways without structures) Embden–Meyerhof pathway, TCA-cycle, Gluconeogenesis, glycogen synthesis,glycogenolysis, HMP-shunt. e) Consequences of hyperglycemia and significance of Glycemic Index and glycemic load f) Dietary fibre (insoluble dietary fibre, soluble dietary fibre) - nutritional significance g) Sugar alcohols **B. Lipids** a) Classification, sources, essential fatty acids (sources), functions b) Digestion, absorption & transport. c) Metabolism of fatty acids- beta oxidation & biosynthesis of fatty acids, cholesterol functions, prostaglandin, recommendation for fat (SFA, MUFA, PUFA) d) Composition of various edible oils –its anti-atherogenic role	**15**
Unit III	**A. Protein** a) Classification of amino acids (chemical& nutritional), protein structure, b) Sources (animal protein versus plant protein, casein, whey protein, egg protein, wheat germ protein, soy protein) c) Digestion, absorption and transport d) Amino acid metabolism (brief outline)	**15**

	e) Amino acid imbalances f) Significance of specific amino acid and biogenic amines(e.g. BCAA, glutamine, GABA, serotonin, histamine, creatine), disposal of ammonia (urea cycle without structure),protein synthesis. g) Recommended Dietary Allowances h) Evaluation of protein quality (NPR, NPU, DIAS,PDCAS, BV) **B. Enzymes** a) Definition, classification b) Enzyme specificity c) Factors affecting enzyme action d) Enzyme inhibition e) Enzymes of industrial significance **C. Vitamins** a) Vitamin stability, toxicity, dietary recommendations, bioavailability, General causes of losses and variations in vitamin content of foods. b) Fat soluble vitamins – A, D, E and K – structure, general properties and functions c) Water soluble vitamins – C and B- complex – structure, general properties and functions **D. Minerals** a) Macro minerals (Calcium, phosphorus, potassium, sodium & magnesium) & Micro minerals (Iron, zinc, copper, iodine,fluorine, chromium, selenium) b) Sources, Bio-availability, losses and stability, RDA, specific physiological and metabolic roles, deficiency, toxicity or effects of excess consumption.	

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Course code	Title	Periods/week	Marks	Credits
PSHSIBP101	**FOOD SCIENCE PRACTICAL**	**3**	**50**	**2**

Objectives:

1. To understand principles of food science involved in bringing changes in foods.
2. To observe and identify physical and chemical changes underlying the preparation of diverse foods.

Course content		Periods
Unit I	**A. Solutions and Ice crystallization**: a) Effect of formula and procedure on crystal size of frozen deserts **B. Sugar cookery** a) Tests for stages of sugar cookery b) Effect of dry heat on sucrose. c) Crystalline and Non crystalline candies	**15**
Unit II	**A. Cereals and Flours** a) Gelatinization of Starch (different types) b) Comparison of different cereals for water absorption and consistency c) Comparison of - different methods of cooking rice, different varieties of rice d) Starches as thickening agents (potato, corn and other) **B. Temporary and Permanent emulsions** a) Salad Dressings b) Effect of Stabilizers and Emulsifiers in salad dressings c) Comparisons of low fat and high fat French dressing d) Preparation and Comparison of Mayonnaise with variations (with and without egg) **C. Principles that maintain high quality fried foods** a) Smoke point of different fats and oils b) Effect of Temperature on fat absorption c) Effect of Formulation on fat absorption d) Effect of Coating and binding agents on fat absorption e) Comparison of Texture, flavor and mouth-feel of food products using fat substitutes	**15**
Unit III	**A. Effect of different conditions on properties of proteins e.g milk** a) Effect of acids (citric acid, lactic acid and acetic acid) on coagulation of milk proteins b) Effect of gums on gelation c) Effect of fat content, pH stabilizers in cream and whipped toppings d) Difference between natural and processed Cheese **B. Examination of properties of egg/meat** a) Denaturation and Coagulation b) Egg white foams – volume and stability c) Effect of acid and alkalies on meat/poultry **C. Factors affecting Gelatin gel** a) Temperature of liquid b) Proteolytic enzymes c) Whipping **D. Factors affecting vegetable pigments** a) Temperature b) Acid, c) Alkalies **E. Pectin gel** a) Determination of pectin content, development of a fruit jam, using natural and commercial pectin.	**15**

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Course code	Title	Periods/week	Marks	Credits
PSHSIBP102	**ANALYTICAL FOOD CHEMISTRY-I**	**3**	**50**	**2**

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		Periods
Unit I	a) Estimation of ash content in different foods. b) Estimation of moisture content by air oven method c) Estimation of calcium content in different foods. d) Modified Gravimetric determination of calcium e) Calcium determination using EDTA titration f) Calcium determination using redox titration g) Determination of phosphorous content of foods by colorimetry h) Determination of phytin phosphorus in foods i) Estimation of iron content of different foods by colorimetric methods j) Mohr titration of salt in butter (AOAC method 960.29)	**15**
Unit II	a) Determination of iodine content in salt b) Estimation of reducing and non reducing sugars in different foods by Lane Eynon's method.	**15**
Unit III	a) Titrable acidity assessment in orange juice, yogurt, apple juice and grape juice b) Estimation of tannin content in tea c) Sodium content in different foods by Flame photometric method d) Potassium content in different foods by flame photometric method	**15**

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M.Sc. (HOME SCIENCE) BRANCH IB : FOOD PROCESSING AND PRESERVATION

SEMESTER II

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods/ week	Credits
PSHSI201	Research Methods and Biostatistics - Paper II	Theory	40	60	100	3	4
PSHSIB202	Principles of Food Preservation	Theory	40	60	100	3	4
PSHSIB203	Food Informatics and Packaging	Theory	40	60	100	3	4
PSHSIB204	Principles of Food Analysis	Theory	40	60	100	3	4
PSHSIB205	Advances in Human Nutrition	Theory	40	60	100	3	4
PSHSIBP201	Food Product Development Practical	Practical	-	50	50	3	2
PSHSIBP202	Analytical Food Chemistry-II Practical	Practical	-	50	50	3	2
	Total		260	340	600	21	24

Course code	Title	Periods/week	Marks	Credits
PSHSI201	**RESEARCH METHODS AND BIOSTATISTICS PAPER II**	**3**	**100**	**4**

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

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Course code	Title	Periods/week	Marks	Credits
PSHSIB202	**PRINCIPLES OF FOOD PRESERVATION**	**3**	**100**	**4**

Objective:
To learn important methods for food preservation are to ensure the quality of processed food.

Course content		Periods
Unit I	**A. Principles of Food Preservation** a) Meaning, mode of action and changes in foods **B. Use of High temperature (Heat preservation)** a) Moist and Dry heat methods b) Blanching c) Dehydration d) Concentration e) Canning f) Commercial sterilization g) Pasteurization **C. Use of Low Temperatures** a) Cold Preservation: Freezing and Refrigeration- Air freezing b) Indirect contact freezing c) Immersion freezing d) Dehydro-freezing e) Cryo-freezing f) Changes in foods during refrigeration and frozen storage **D. Use of dehydration and Concentration** a) Benefits and factors affecting heat and mass transfer b) Physical and chemical changes during dehydration and concentration c) Methods and techniques used (Air convection, drum driers and vacuum driers) d) Use of various evapourators for concentration of foods	**15**
Unit II	**A. Use of Ionizing radiation and microwave heating** a) Ionizing radiations and sources b) Units of radiation c) Radiation effects d) Mechanism of microwave heating e) Application of radiation technology **B. Use of Fermentation** a) Benefits and mechanisms of fermentation b) Fermented food products e.g Beer, Wine, Soya sauce, Cheese, Soya bean products c) Microbial vs Industrial Fermentation **C. Use of Food Additives** a) Broad classes b) Intentional and unintentional food additives c) Laws and regulations **D. Food Enzymes** and their applications in Food industry. **E. Application of Hurdle Technology**	**15**
Unit III	**Traditional Methods of Food Preservation** a) Smoking b) Sun drying c) Pickling/ Salting	**15**

	d) Fermentation **Recent advances in food preservation** a) Pulse electric field special packaging b) Use of technology for minimal processing for preservation of fresh foods c) Use of Antioxidants in food preservation d) Cold pressed juices e) Use of Natural Preservatives f) Preservatives on food labels	

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** All new journals related to Food Preservation**

Course code	Title	Periods/week	Marks	Credits
PSHSIB203	**FOOD INFORMATICS AND PACKAGING**	**3**	**100**	**4**

Objective:
To enable use of IT to make food-related information available for food researchers.

Course content		Periods
Unit I	**Introduction to Food Packaging: Packaging Trends- Global Scenario** a) Functions/ Objectives/ Purpose of food packaging b) Requirements for effective packaging c) Variations in Packaging d) Package design requirements e) Food Packaging Materials (types, special features) f) Packaging Closures and Sealing Systems g) F.F.S. Operation h) Logistical Packaging for Food Marketing Systems i) Testing and Quality Control j) Shelf-life evaluation of Packaged Food Products k) Application of Nano Technology Environmental concerns and future prospects	**15**
Unit II	**Introduction to food informatics** a) Role of food informatics in food research b) Use of food informatics in food science laboratories and food industries c) Important search engines d) Software and IT skill requirements to build a food database e) Application in major centers of food research in India - CFTRI, DFRL & CIFT, Food Research & Development, Ministry of Food Processing Industries and major Food Industries in India, APEDA and MPEDA f) Careers in food informatics	**15**
Unit III	**Application of Food Informatics** a) Avenues for application of food informatics b) Data collection, organization in areas of food science and nutrition. c) Data storage and distribution by using various information technology tools and methods. d) Database management system. e) Application of various software f) Visit to laboratory/facility to see demonstration of the software	**15**

References
Food Packaging Technology Hand book NIIR New Delhi
Food packaging – Principles & Practice Gordon L Robertson
Food informatics textbooks

Course code	Title	Periods/week	Marks	Credits
PSHSIB204	**PRINCIPLES OF FOOD ANALYSIS**	**3**	**100**	**4**

Objectives:

1. To familiarize students with the principles underlying various analytical methods.
2. To help understand criteria to select appropriate food analysis method.

Course content		Periods
Unit I	**A. Introduction to Food Analysis** a) Trends and demand, consumer and food industry, steps in analysis, choice and validity of method, criteria for choice of food analysis methods, role of AOAC International b) Sampling and sample preparation. c) Brief overview of physical, chemical, Instrumental and Gravimetric methods of analysis. **B. Compositional Analysis of foods** a) Moisture and total solid analysis, ash analysis b) Total fiber analysis c) Protein analysis d) Carbohydrate analysis (mono, oligo and polysaccharides, starch and starch derivatives) e) Vitamin and mineral analysis	**15**
Unit II	**A. Chemical properties and characteristics of foods** a) pH and titrable acidity b) Fat characterization – Analysis of fatty acids, oil fat indices. c) Protein separation, characterization procedures, amino acid composition, Application of enzymes in food analysis, Immunoassays d) Spectroscopy – Basic principles of spectroscopy, ultra violet, visible and fluroscence spectroscopy. Atomic absorption and emission spectroscopy	**15**
Unit III	**A. Physical properties of foods** **B. Chromatographic techniques** a) Principles of chromatography **b)** Types of chromatographic techniques – HPLC, Gas chromatography **C. Rheological principles used for food analysis** a) Viscocity of liquids b) Solutions and fine suspensions **D. Pigments and colourants** a) Extraction, isolation, purification b) Measurements of natural pigments and colour analysis **E. Thermal Analysis** a) Principles and procedures of calorimetry **b)** Differential scanning of calorimeters.	**15**

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2. Wrolstad R.E. et al (2005). *Handbook of Food Analytical Chemistry: Water, Protein, Enzymes, Lipids and Carbohydrates.* Published by John Wiley and Sons
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5. ** All new journals related to Food Science and Processing**

Course code	Title	Periods/week	Marks	Credits
PSHSIB205	**ADVANCES IN HUMAN NUTRITION**	**3**	**100**	**4**

Objectives:

1. To understand the role of nutrition in health and disease
2. To understand the role of various bio-active compounds in health promotion, disease prevention and management

Course content		Periods
Unit I	**Overview of Nutrition and Digestive System** a) Nutrition and Metabolism of Carbohydrates b) Fiber in Nutrition and Health c) Nutrition and Metabolism of Lipids d) Nutrition and Metabolism of Protein and Amino acids e) Ultratrace minerals f) Integration and Regulation of Metabolism and The Impact of Physical Activity g) Body Composition, Energy Expenditure, and Energy Balance	**15**
Unit II	**Nutrient requirements** a) RDA, AI, RDI, TUL, EAR b) Methods of determining RDAs c) National vs International dietary standards d) Food pyramid, food plate e) Concerns of RDAs for vulnerable groups of population **Role of nutrition in health and disease** a) Metabolic and lifestyle disorders (diabetes, cvd etc) b) Nutragenomics and Inborn Errors of Metabolism	**15**
Unit III	**Complementary Nutrition** a) Role of selected bioactive constituent b) Functional foods and nutraceuticals in health promotion, disease prevention and management. c) Beta glucan/ Arabinoxylan/ Resistant starch d) Bioactive peptides and GABA e) Ω-3 fatty acids, CLA, Phytosterols f) Probiotics/ Prebiotics/Synbiotics g) Phytochemicals (Phenolics/ Flavanoids/ Carotenoids/ Isoflavones)	**15**

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Course code	Title	Periods/week	Marks	Credits
PSHSIBP201	**FOOD PRODUCT DEVELOPMENT**	**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
Unit I	**Food Product Development** a) Hypothetical proposal for new product development b) Nutritive value of foods, Enhancement of Nutritive Value c) Role of Ingredients d) Understanding weights and measures, metric conversions e) Use of Ready Reckoners /Exchange list/ NIN Food database/ USDA Food Database f) Construction of Recipes (Standard, File Card format, Picture recipes) g) Waste Utilisation, Cost Effectiveness, Value Addition **Sensory evaluation of foods** a) Threshold concentrations of primary tastes. b) Effect of Temperature on taste. c) Identification of samples through Difference, Descriptive and Affective testing d) Determination of sensory evaluation methods for evaluating quality e) Developing score card as an evaluation tool	**15**
Unit II	**Food Product Development laboratory trials** a) Categories: Fruit based snacks, Long shelf life snacks, High protein snacks/beverages (whey protein), Ready to eat breakfast cereal, Probiotic yoghurt/ beverage, Salad dressing, Low fat snack product b) Development of the formula (Modification of Home based recipes for Innovation) c) Preparing a flow chart indicative of the operational processes d) Understanding the concept of scale up e) Identifying suitable packaging material f) Shelf life studies in various altered conditions	**15**
Unit III	**Marketing exercise** a) Business Analysis b) Marketing Strategy c) Launching of the product d) Evaluation of product acceptability on the basis of cost effectiveness and other e) nutritive parameters through survey	**15**

References

Jameson K. (1998). *Food Science – A Laboratory Manual*, New Jersey:Prentice Hall Inc.

Lawless, H. and Heymann, H. (1998).*Sensory Evaluation of Food – Principles and Practices*, Kluwer Academic/Plemer Publishers.

McWilliam, M.(2001). *Foods – Experimental Perspectives* (4th Ed.), New Jersey: Prentice Hall Inc. USA: CRC Press Inc..

Weaver, C. (1996), *Food Chemistry Laboratory – A manual for Experiemental Foods*

Course code	Title	Periods/week	Marks	Credits
PSHSIBP202	**ANALYTICAL FOOD CHEMISTRY-II**	**3**	**50**	**2**

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		Periods
Unit I	a) Determination of crude fiber in different foods. b) Protein estimation in different foods by Kjeldahl method, Lowry's method and Biuret and Bradford method. c) Crude fat determination by solvent extraction method d) Fat characterization with respect to the determination of the following: e) Refractive index, melting point, solid fat index, cold test, smoke point,	**15**
Unit II	a) Iodine value b) Saponification number c) Acid value d) Free fatty acids value e) Peroxide value f) Estimation of thiamin content of foods by Fluorimetric method. g) Estimation of riboflavin content of foods by Fluorimetric method. h) Estimation of ascorbic acid content of different foods by 2,6 dichloro indophenol method	**15**
Unit III	a) Different chromatographic techniques: Paper chromatography, Thin layer chromatography and HPLC techniques b) Estimation of lycopene in tomatoes c) Estimation of oxalates from spinach d) Estimation of Total Polyphenol content in green tea e) Estimation of chlorophyll extract in leafy vegetables by spectrophotometric method. f) Visit to Research Institutes and Food Industries	**15**

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 8th edition longman scientific and Technical, U.K.

A.O.A.C. (1990) Official Methods of Analysis 15th 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, 6th ed., London, T.A. Churchill.

UNIVERSITY OF MUMBAI

Syllabus

SEMESTER I & SEMESTER II

Program: M.Sc.

Course: Home Science

Branch IC: Sports Nutrition

(Self Financing Course)

(Credit Based Semester and Grading System

with effect from the academic year 2016–2017)

M.SC. (HOME SCIENCE) BRANCH-IC : SPORTS NUTRITION

SEMESTER-I

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods / week	Credits
PSHSI101	Research Methods and Biostatistics Paper I	Theory	40	60	100	3	4
PSHSIC102	Human Physiology and Kinesiology	Theory	40	60	100	3	4
PSHSIC103	Advances in Nutritional and Clinical Biochemistry	Theory	40	60	100	3	4
PSHSIC104	Nutrition and Fitness	Theory	40	60	100	3	4
PSHSIC105	Principles of Nutritional Assessment	Theory	40	60	100	3	4
PSHSICP101	Diet planning	Practical	-	50	50	4	2
PSHSICP102	Assessment of Body Composition and Physical Fitness	Practical	-	50	50	3	2
	Total				600	22	24

Course code	Title	Periods/week	Marks	Credits
PSHSI101	**RESEARCH METHODS AND BIOSTATISTICS- PAPER I**	**3**	**100**	**4**

Objectives:

1. To inculcate knowledge about essentials of high quality research.
2. To introduce students to the skills needed in conducting a research.

Course content		Periods
Unit I	A. **An introduction to research methodology**: -Definition, Objectives of research **Types of research** a) Descriptive vs. Analytical b) Applied vs. Fundamental c) Quantitative vs. qualitative d) Conceptual vs. Empirical **Other types:** a) Cross sectional vs. longitudinal b) Field setting or laboratory c) Clinical or diagnostic d) Exploratory Research e) Historical research. B. **Research approach**: Quantitative and qualitative approach C. **Ethics in research:** a) Applying for ethical approval/ clearance b) Defining the research problem: Selecting and defining the problem D. **Literature review** E. **Formulation of hypothesis** F. **Research designs:** a) Need for a research design, features of a good design b) Types of research designs- Explorative/ descriptive/ experimental/ Survey/ Case Study	**15**
Unit II	**A. Sampling techniques for nutrition research** a) Sample design-Criteria of selecting a sampling procedure b) Characteristics of a good sampling design c) Types of sample designs: -Non-probability sampling -Probability sampling -Purposive sampling -Simple random sampling -Systematic sampling -Stratified sampling -Quota sampling -Cluster sampling - Multi-stage sampling -Sequential sampling. d) Determination of sample size for different type of research **B. Measurement and scaling techniques** a) Measurement scales: Nominal, Ordinal Interval, Ratio b) Validity c) Reliability and Practicality d) Scaling, scaling techniques e) Rating scales (paired comparison, rank order), likert scales etc.	**15**
Unit III	**A. Methods/ tools of data collection** a) Collection of primary data: Observation method, Interview method, Questionnaire method, case study method. b) Collection of secondary data	**15**

	c) Selection of appropriate method of data collection **B. Data processing and management** a) Processing operations: Editing, coding, classification, tabulation b) Use of data entry software (MS Excel & SPSS)	

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
PSHSIC102	**HUMAN PHYSIOLOGY AND KINESIOLOGY**	**3**	**100**	**4**

Objectives:

1. Knowledge and understanding of the skeletal and muscular systems
2. Knowledge and understanding of the functions of the musculoskeletal system in producing and controlling human movement
3. Knowledge and understanding of basic biomechanical principles which govern human movement
4. Application of biomechanical principles to physical activity, exercise performance and sport skills
5. Ability to analyze physical activity in terms of musculo-skeletal components and mechanical principles

Course content		Periods
Unit I	**Skeletomuscular system** **A. Physiology of Skeletal system** a) Bone cells, Bone formation & remodeling b) Factors influencing bone formation c) Types of joints d) Bone injuries during exercise training **B. Physiology of muscle tissue** a) Structure, chemical composition b) Types of muscle fibers c) Mechanism and energetics of muscle contraction d) Muscle fatigue **C. Anatomical and Physiological Fundamentals of Human Motion-** a) The Skeletal Framework and Its Movements b) Neuromuscular Basis of Human Motion **D. Fundamentals of Biomechanics** a) Terminology and Measurement in Biomechanics b) The Description of Human Motion c) The Conditions of Linear Motion d) The Conditions of Rotary Motion e) The Center of Gravity and Stability **E. Kinesiology of Fitness and Exercise-** a) **Moving Objects:** -Pushing and Pulling -Throwing, Striking, and Kicking, Locomotion: Solid Surface b) **Locomotion:** - The Aquatic Environment, &When Suspended and Free of Support	**15**
Unit II	**Digestive and Nervous system** **A. Physiology of gastro intestinal system** a) Structure of GI and functions b) The process of digestion and absorption of food c) Factors affecting digestion, absorption and bioavailability of macro and micro nutrients **B. Physiology of Nervous system** a) Structure of neurons b) Nervous system and functions c) Membrane potential d) Inter cellular communication	**15**
Unit III	**Cardiovascular, & Renal systems** **A.Cardiovascular system** a) Blood composition b) Functions of formed elements of blood and plasma proteins c) Synthesis of blood elements d) Cardiac cycle	**15**

	e) Regulation of blood pressure f) Factors influencing Blood Pressure **B.Renal system** a) Structure and Functioning of kidneys **b)** Formation of urine, composition of urine, normal and abnormal constituents of urine, acid - base balance.	

References

Davier, A, Blakeley, G. H. and Kidd, C (2001) *Human Physiology*, Harcourt Pub., 1st ed. Edinburgh Churchill Livingstone.Laboratory Manual, NIN

McArdle, WD., Katch, F. L. &Katch, VL (1996) *Exercise Physiology*, (4th ed.), Williams & Wilkins, A Waverly Company

Rhodes, R &Pflouzer, R (2003) *Human Physiology*, Thomson Brooks & Cole, (4th Ed).

Tortora, G. J. and Grabowski, R. S. (1993) *Principles of Anatomy and Physiology*, (7th ed.).Harper Collins College Publishers.

Waugh, A. and Grant, A. (2006) *Anatomy and Physiology in Health and illness* Churchill Livingstone, 10th ed.

Course code	Title	Periods/week	Marks	Credits
PSHSIC103	**ADVANCES IN NUTRITIONAL AND CLINICAL BIOCHEMISTRY**	**3**	**100**	**4**

Objectives:

At the completion of this course the student should be able to

1. Describe structure, functions and metabolism of macronutrients.
2. Describe hormonal and enzymatic modulators to the metabolism of macronutrients.
3. Describe the biochemistry and metabolism of the macronutrients during different physiological states.
4. List important micronutrients needed as cofactors involved in macronutrient metabolism.
5. Explain the metabolic inter relationship between macronutrients.
6. Have knowledge of current research on Nutrition, Metabolism and dietetics.

Course content		Periods
Unit I	Biomolecules of Nutritional Significance a. Carbohydrates – Oligosaccharides, Polysaccharides, sugar alcohols, Glycosides (3) b. 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) (6) c. Lipids – Compound Lipids, Fatty acids, MCT's, Cholesterol, Prostanoids.(3) d. Nucleic acids Structure, properties and functions of DNA, RNA. Outline of Replication, Transcription, Translation in prokaryotes. Mutation ,DNA repair mechanism	15
Unit II	Enzyme Chemistry and Metabolism of Macronutrients.& Energy Production a. IUB classification of enzymes. Active site ,Coenzymes,. Factors affecting enzyme activity. Enzyme inhibition. b. Digestion, absorption, transportation and metabolism of macronutrients(no structures) EMP,TCA,HMP,Glycogen metabolism.Cori's cycle General reactions of amino acids,Urea cycle Beta Oxidation,Ketone body formation. ETC,ATP production and Mechanism of Oxidative and Substrate level phosphorylation	15
Unit III	A.Overview of Endocrinology 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 B.Clinical Research and Ethical Issues- Clinical Trials – Stages I to IV, Clinical Research and its significance , Biomedical ethics in clinical trials	15

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 MedicalPublishers 2005.

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Montgomery, Rex and others *Biochemistry A case oriented Approach* St. Louis The C.V. Mosby Co. 1977.

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Lehninger, A.L.; Nelson D.L. and Cox. M.M., *Principles o Biochemistry* 3rd ed. New York. Worth PublishersMcMullan 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
PSHSIC104	**NUTRITION AND FITNESS**	**3**	**100**	**4**

Objectives:

1. To understand the various dimensions of holistic fitness
2. To understand the concepts of stress and its implications on Health
3. To imbibe knowledge about basic nutrition and influence of nutrition on fitness

Course content		Periods
Unit I	**A. Definition of Health and wellness** a) Factors affecting health and wellness b) Physiological, psychological and social health **B. Holistic Fitness** a) Definition, Types &Components of holistic Fitness **C. Physical fitness** a) Definition, components and Factors influencing physical fitness **D. Psychological Fitness** a) Addictive Behavior and its Effect on Health b) Risk factors of addiction c) Harmful effects of substance abuse d) Strategies to overcome substance abuse **E. Fitness for Life** a) Importance of exercise in preventing life style diseases - Diabetes, CVD, hypertension, obesity and osteoporosis b) Adherence to a fitness program regime c) Factors that affect adherence d) Difficulties faced in adherence	**15**
Unit II	**A. Fundamentals of nutrition** a) Macronutrients & Micronutrients: Overview of the types & functions, conditions of deficiency and excess b) Energy: Components of energy expenditure & Energy requirement c) Quality issues, contribution of macronutrients to total energy intake d) Energy imbalances	**15**
Unit III	**A. Influence of nutrition on Fitness** a) Malnutrition-Over & Undernutrition b) Changes in body composition c) Effect of macro (carbohydrates, amino acids, EFA) and micronutrients (Vitamins & Minerals) on physical & mental fitness	**15**

References

Powers, S. and Dodd, Stephen (1996) *Total fitness*, Allyss and Bacon, Univ. of Florida

Hoeger, W., Turner, Low and W. Hafen Brent (2002), *Wellness Guidelines for ahealthy life style* Wadsworth/Thomas Learning USA.

Brannon, L. and Feist, Jess (2000), *Health Psychology IV edition, An Introduction to behaviour and health*,Wadsworth USA.

Schafer Walt (1998) *Stress Management for IV ed. Wellness* Wadsworth USA.

Mind, body and soul (1998) The body shop, Bullyinch press book, little Brown and co.Bhat and Savur, S. (1998) *Fitness for life*, Jaico publishing House

Course code	Title	Periods/week	Marks	Credits
PSHSIC105	**PRINCIPLES OF NUTRITIONAL ASSESSMENT**	**3**	**100**	**4**

Objectives:

1. To enable students understand human body composition
2. To enable students learn principles of body composition and nutritional assessment

Course content		Periods
Unit I	**A. Body composition** a) Components of body composition b) Human Body composition- Changes during life cycle c) Factors influencing Body composition –Gender, Age, Exercise d) Methods of measuring body composition	**15**
Unit II	**A. Anthropometrical, Biochemical & Clinical assessment of nutritional status of various age groups & gender** a) Anthropometrical assessment-Linear measurements b) Circumference measurements c) Impedance techniques d) Measurement of total body protein & fat using standard formulae & Interpretation e) Biochemical assessments of nutritional status f) Clinical assessment of nutritional status	**15**
Unit III	**A. Dietary & Functional assessment of nutritional status** a) Dietary surveys- Tools of dietary surveys- FFQ, Interview schedules, questionnaires, SGA, Recall & record methods b) Protocols: merits & demerits **c)** Functional assessment: Functional indicators of macro and micro nutrients, disturbances & interpretation, GPAQ, WPAQ, IPAQ	**15**

References

Dandekar, S. P., Rane, S. A. (2004) *Practical and Viva in Medical Biochemistry*, New Delhi, Elsevier/Reed Elsevier India PVT LTD.

Godkar, P. B. (2003)*Textbook of Medical Laboratory Technology*, (2nd ed.), Mumbai, Bhalani Publishing House, Mumbai

Sadasivan , S. &Manickam, A, (2003) *Biochemical Methods*, (2nd ed.), New age International Pvt. Ltd.

Sauberlich, H. E. (1999) *Laboratory tests for the Assessment of Nutritional Status*, (2nd ed.)., CRC press Laboratory

Manual, NIN.

Course code	Title	Periods/week	Marks	Credits
PSHSICP101	**PRINCIPLES OF DIET PLANNING**	**3**	**50**	**2**

Objectives:

1. To enable students to develop expertise in the process of diet planning for normal individuals across life cycle stages for prevention of disease and preservation of health.
2. To understand the methodology of developing holistic, healthful menus and ensuring adequate macronutrient, micronutrient and fiber profile in the developed menus.
3. To become well versed with different cuisines and recipes used in India and globally.

Course content		Periods
Unit I	**Diet Planning for a Normal Adult** **A. Planning:** a) Recommended Dietary Allowances and the Exchange List b) Principles of establishing energy intake and proximate principles c) Principles of Menu Planning d) Overview of the traditional cuisines and eating patterns in India and in the Global Scenario e) Process and relevance of detailed calculations f) Relevance and recommendations for use and prescription of syllabus g) Process of Standardisation **B. Preparation:** a) Standardisation of basic Indian recipes. b) Preparing a meal from the planned menu, Evaluation and analysis	**15**
Unit II	**Diet planning for various lifecycle conditions in adult hood** **A. Planning:** a) Pregnancy b) Lactation c) Geriatric **B. Preparation:** a) Preparing a meal from the planned menu b) Evaluation and analysis	**15**
Unit III	**Diet planning in infancy, childhood and adolescence** **A. Planning:** a) Complementary Feeding b) Infant nutrition c) Childhood d) Adolescence **B. Preparation:** a) Preparing a meal from the planned menu b) Evaluation and analysis	**15**

References

Brown. J. (2013). *Nutrition Through The Lifecycle*. Wadsworth Pub Co.

Gopalan .C.(2000). *Nutritive Value of Indian Foods*. NIN ICMR Pub.

ICMR Pub. (2012). *Nutrient Requirement and Recommended Dietary Allowances for Indians*

Mahan .K.L. (2012). *Krause's Food and Nutrition Therapy* Saunders Pub.

Peckenpaugh.N. (2003*) Nutrition Essentials and Diet Therapy*. 9th ed. Saunders Pub Co.

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Shills. M. (2006). *Modern Nutrition in Health and Disease*.10th ed.Lippincot William and Wilkins.

Course code	Title	Periods/week	Marks	Credits
PSHSICP102	**ASSESSMENT OF NUTRITIONAL STATUS**	**3**	**50**	**2**

Objectives:

1. To enable students understand the importance of biomarkers of nutritional status in the management of holistic fitness.
2. To help the students acquire practical skills in the biochemical assessment of nutritional status of individuals

Course content		Periods
Unit I	**A. Anthropometrical assessment of body composition** a) Height, Weight, BMI, Circumference measurements (Head, Arm, waist, abdominal circumference, WHR etc.);, shoulder girth b) Calculating body composition using standard Formulae c) Impedance techniques (BIA & Body stat) d) Skinfold measurements&Assessment of Body types using formulae e) DEXA, BMD (Visit)	**15**
Unit II	**Biochemical assessment:** **A. Assessment of protein nutriture** a) Estimation of serum Protein, Albumin and A: G Ratio (Biuret method) b) Urinary creatinine/Height index, Urinary urea. c) Evaluation of PEM in pediatric, adult, geriatric and sports persons. **B. Biomarkers of vitamin status** **C. Fat soluble vitamins**: a) Vitamin A, Vitamin D, Vitamin E b) Serum Retinol, Conjunctival Impression Cytology (CIC) and Dark Adaptation technique. c) Serum Alkaline Phosphatase, (Vitamin D) d) Serum Total tocopherol level and TBARS (Spectrophotometric analysis)	**15**
Unit III	**Biochemical assessment:** **A. Water Soluble Vitamins** a) Serum and Urinary Vitamin C (dye method) b) Microscopic examination of RBC for megaloblasticanaemia **B. Assessment of Mineral nutriture** a) Estimation of serum Iron (Dipyridal method); Calcium (clark-Collip method. **C. Clinicalassessment of body composition** a) Observation of clinical symptoms of nutrient deficiencies b) Field visits/Demonstrations/Guest lectures	**15**

References

Dandekar, S. P., Rane, S. A. (2004) *Practical and Viva in Medical Biochemistry*, New Delhi, Elsevier/Reed ElsevierIndia PVT LTD.

Godkar, P. B. (2003)*Textbook of Medical Laboratory Technology*, (2nd ed.), Mumbai, Bhalani Publishing House, Mumbai

Sadasivan , S. &Manickam, A, (2003) *Biochemical Methods*, (2nd ed.), New age International Pvt. Ltd.

Sauberlich, H. E. (1999) *Laboratory tests for the Assessment of Nutritional Status*, (2nd ed.)., CRC press Laboratory

Manual, NIN.

M.SC. (HOME SCIENCE) BRANCH-IC : SPORTS NUTRITION

SEMESTER-II

Course Code	Title		Internal Marks	Semester End Exam	Total Marks	Periods/ week	Credits
PSHSI201	Research Methods and Biostatistics Paper II	Theory	40	60	100	3	4
PSHSIC202	Nutrition for Endurance Sports	Theory	40	60	100	3	4
PSHSIC203	Exercise Physiology	Theory	40	60	100	3	4
PSHSIC204	Ergonomics	Theory	40	60	100	3	4
PSHSIC205	Nutrition through Lifecycle	Theory	40	60	100	3	4
PSHSICP201	Diet Planning for Endurance Sportspersons (Practical)	Practical	-	50	50	4	2
PSHSICP202	Exercise Physiology (Practical)	Practical	-	50	50	3	2
	TOTAL				**600**	**22**	**24**

Course code	Title	Periods/week	Marks	Credits
PSHSI201	**RESEARCH METHODS AND BIOSTATISTICS -PAPER II**	**3**	**100**	**4**

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

References

Mahajan B.K. (2010). Methods in Biostatistics for Medical students and Research Workers, Jaypee Brothers Medical Publishers (P) Ltd.

Pagano, M. and Gauvreau, K. (2011).Principles of Biostatistics.Cengage Learning India Private Limited.

Bhattacharyya, G.K. & Johnson, R. A. (1977).Statistical Concepts and Methods. NY: John Wiley.

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Leong, F.T.L., & Austin, J. T. (Eds.) (1996).The Psychology Research Handbook. New Delhi: Sage

Course code	Title	Periods/week	Marks	Credits
PSHSIC202	**NUTRITION FOR ENDURANCE SPORTS**	**3**	**100**	**4**

Objectives:

1. To enable students understand the principles of nutrition for endurance athletes
2. To impart knowledge on sports specific nutrition & hydration guidelines
3. To enable students understand the applications of ergogenic aids in endurance sports.

Course content		Periods
Unit I	**A. Types of endurance sports; Energy & Macronutrient needs** a) Types of endurance sports; body compositional standards b) Energy metabolism during endurance exercise & energy needs of endurance athletes **B.Macronutrient needs of endurance athletes** a) Sport specific nutritional guidelines b) Carbohydrates-Type & Timing of carbohydrate ingestion, Glycogen loading techniques c) Lipids- Use of ketogenic diets, Fat loading, strategies to enhance fat utilization/ Fat burners d) Proteins-Requirements, Role of protein in endurance exercise	**15**
Unit II	**A. Micronutrient requirements of endurance athletes** a) Vitamins & Minerals: Micronutrients that regulate energy metabolism, blood formation, bone health b) Antioxidant micronutrients c) Sports anemia and other sports specific micronutrient deficiencies d) Water & Electrolytes: Fluid & electrolyte requirements, Dehydration e) Fluid & electrolyte replacement strategies f) Sports drinks and sports gel	**15**
Unit III	**Sports specific nutritional & hydration guidelines** a) Short & long duration events eg: cycling, marathon, Triathlon, swimming, Rowing, sailing, etc. b) Dietary guidelines for training & competition c) Dietary guidelines on season and off season	**15**

References

Ryan Monique (2015 Sports Nutrition for Endurance Athletes, 3rd Ed. 3002 Sterling Circle, Suite 100, Boulder, Colorado 80301-2338 USAISBN 978-1-934030-82-0

Bernadot Dan (1999) *Nutrition for Serious Athletes*, Human Kinetics USA.

Brouns Fred and Caustan – Cargill (2002) *Essentials of Sports Nutrition* – 2nd edition John Wiley and Sons, England.

Burke Louse and Deakin Vicky (2006) *Clinical Sports Nutrition*, McGraw – Hill Pvt. Ltd. Australia

Summerfield Lianne M (2001), *Nutrition Exercise and Behavior An integrated approach to weight management*,Belmount (USA). Wadsworth/Thompson Learning

Wolinksy Ira (1998) *Nutrition in Exercise and Sports* CRC press Boca Raton

Wolinksy Ira, Drishill Judy (1997) *Sports and Nutrition Vitamins and Trace elements*, CRC Press BY.

Wolinskoy Ira, Driskell J. (2004) *Nutritional Ergogenic Aids*, CRC Press NY.

Course code	Title	Periods/week	Marks	Credits
PSHSIC203	**EXERCISE PHYSIOLOGY**	**3**	**100**	**4**

Objectives:

1. To impart knowledge on the physiological effects of exercise on human body composition.
2. To explain to the students the body compositional requirement for various athletic and sports categories.
3. To enable the students understand the role of exercise in fitness.
4. To enable the students understand the therapeutic benefits of exercise.

Course content		Periods
Unit I	**A. Types of exercises**- aerobic & anaerobic exercises, a) Energy systems b) Energy transfer during exercise c) Exercise & thermal stress d) Effect of exercise on thermoregulation **B. Effect on Cardio-Pulmonary system** a) Effect of aerobic and anaerobic exercise training on pulmonary and cardiovascular fitness b) Markers of cardiovascular & pulmonary fitness-Response & Adaptation to exercise C. **Endocrine response to exercise training**	**15**
Unit II	**A. Effect on Skeletomuscular system** a) Response& Adaptation to exercise- Endurance, resistance and flexibility; and their effect on the composition and strength of muscle. b) Effect of training on muscle c) Exercise related muscle and bone injuries d) Adaptation to exercise, causes and concerns e) Markers of skeletal muscular fitness **B. Ergogenic aids-use and concerns** **C. Anti-doping regulations**	**15**
Unit III	**A.Exercise for Special conditions and Populations** a) Special groups – Pregnant women, Children and Adolescents b) Benefits of exercise clinical conditions: Heart disease, Diabetes, Hypertension, Arthritis, Osteoporosis c) Exercise in Environmental Stress (High Altitude, Heat & Cold) d) Exercise Program Designing & Implementation for the above conditions (Aerobic & Strength Training)	**15**

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Course code	Title	Periods/week	Marks	Credits
PSHSIC204	**ERGONOMICS**	**3**	**100**	**4**

Objectives :

To enable students to understand.

1. The principles and applications of ergonomics in sports field.
2. The ergonomic considerations for special populations.
3. Evaluation of sports injuries and rehabilitation.

Course content		Periods
Unit I	**A. Ergonomics** a) Definition and applications in sports **B. Competitive and Training Stress in Sport** a) Physiological Loading b) Spinal Loading c) Physical Loading d) Psychological Loading **C. Measurement in sports & exercise** a) Metabolic testing & power testing **b)** Optimizing training and performance goals	**15**
Unit II	**A. Environmental Influence on sports performance** a) Sports Equipment and Playing Surfaces, b) Sports Clothing, Foot wear and orthotics c) Field conditions for team games **B. Circadian Rhythms** a) Training and Time of Day, Sleep–Wake Cycle b) Travel Fatigue and Jet Lag c) Sleep Deprivation or Disruption d) Nocturnal Shift Work e) Strategies to manage normal circadian rhythms in international athletes **C. Ergonomic considerations for corporate and special populations** a) Occupational ergonomics for corporate offices, schools and colleges b) Pediatric and adolescent sports persons c) Disabled and ageing athletes	**15**
Unit III	**A. Sports injuries** a) Types, Evaluation & rehabilitation b) Core strengthening, c) Prolotherapy d) Postoperative athletes e) Protective devices for sports persons-head gear & knee bracing f) Participatory Ergonomics- Human Enhancement Technologie g) Performance and Cognitive Enhancement h) Mechanical & psychological ergogenic aids	**15**

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Course code	Title	Periods/week	Marks	Credits
PSHSIC205	**NUTRITION THROUGH LIFE CYCLE**	**3**	**100**	**4**

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		Periods
Unit I	**Nutrition during Pregnancy & lactation** **A. Pregnancy:** a) Physiology of pregnancy b) Effect of Nutritional Status on pregnancy outcome c) Nutritional requirements and dietary guidelines d) Nutrition related complications **B. Lactation**: e) Physiology of Lactation f) Human milk composition g) Nutritional requirements & dietary guidelines h) Benefits of Breast Feeding	**15**
Unit II	**A. Nutrition in infancy, Childhood & Adolescence** a) Physiological development, Motor, Cognitive development. b) Energy and nutrient needs c) Common nutrition problems d) Nutritional concerns (Deficiency disorders) e) Malnutrition- undernutrition & Obesity f) Eating disorders	**15**
Unit III	**A. Nutrition in the adulthood** a) Physiological and Psychosocial changes in adults b) Common nutritional concerns c) Defensive Nutrition paradigm d) Nutritional requirements and dietary recommendation **B. Nutrition in aging** a) Theories of Aging, Physiological and Psychosocial changes in the elderly b) The Aging Process c) Nutritional requirements of the Elderly d) Nutrition care	**15**

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Course code	Title		Periods/week	Marks	Credits
PSHSICP201	**EXERCISE PHYSIOLOGY PRACTICAL**		**3**	**50**	**2**

Objectives:

To enable the students to learn

1. Health Screening & Risk Stratification using various techniques of body composition analysis
2. Techniques of assessment of physical fitness of various groups of population

Course content		Periods
Unit I	a) Health Screening & Risk Stratification b) Theoretical explanation, demonstration and assessment of cardio respiratory fitness -Treadmill stress test - Spirometry - Step tests - Resting assessments: Heart rate monitoring, Blood Pressure, Body Composition c) Cycle ergometer test etc. d) Aerobic fitness testing (VO_2max testing)	**15**
Unit II	**Assessment of skeletomuscular fitness-**Measurement of: a) BMD (Visit/ Demonstration) b) Muscle strength c) Endurance d) Strength e) Flexibility & agility (Bench press, Jumps, Push ups, Sit and Reach Test), Sit-ups, Shuttle run, Hand grip dynamometeretc)	**15**
Unit III	a) Assessment of physical fitness of various groups of population- children, adolescents, adults & elderly –case study b) Metabolic Calculations c) Exercise prescription for Weight Management (Underweight & Overweight)	**15**

References

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Waugh, A. and Grant, A. (2006) *Anatomy and Physiology in Health and illness* Churchill Livingstone, 10th ed.

Course code	Title	Periods/week	Marks	Credits
PSHSICP202	**DIET PLANNING FOR ENDURANCE SPORTSPERSONS PRACTICAL**	**3**	**50**	**2**

Objectives:

1. To enable students learn planning & cooking of diet for endurance sports persons of various age groups & gender.
2. To train the students in conducting case studies on endurance sports persons

Course content		Periods
Unit I	Planning & preparation of diets for Distance Running, Marathon, Ultra marathon, Obstacle racing and Triathlon	**15**
Unit II	Nutrition for Road Cycling, Mountain Biking, Track Cycling, and Cyclo-Cross, Cross-country skiing , Nutrition for Rowers and swimmers	**15**
Unit III	Case study presentations on the Diet & Training schedule of competitive endurance athletes	**15**

References

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M.Sc. (HOME SCIENCE) BRANCH II : HUMAN DEVELOPMENT

SEMESTER I

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods / week	Credits
PSHSII101	Research Methods and Statistics I	Theory	40	60	100	4	**4**
PSHSII102	Advanced Study of Theories of Human Behaviour and Development I	Theory	40	60	100	4	**4**
PSHSII103	Advanced Study of Counselling and Psychological Testing I	Theory	40	60	100	4	**4**
PSHSII104	Research in Early Childhood, School, and Higher Education	Theory	40	60	100	4	**4**
PSHSIIP101	Group Research Project I	Practical	--	50	50	3	**2**
PSHSIIP102	Early Childhood Education Practicum	Practical	--	50	50	4	**2**
PSHSIIP103	Counselling Practicum I	Practical	--	50	50	2	**2**
PSHSIIP104	Psychological Testing Practicum I	Practical	--	50	50	2	**2**
	TOTAL		**160**	**440**	**600**	**27**	**24**

Course Code	Title	Lectures/Week	Marks	Credits
PSHSII101	**Research Methods and Statistics I**	**4**	**100**	**4**

Objectives

1. To build in students appreciation for high quality research in Human Development and allied areas.
2. To introduce students to the skills needed in conducting a research in Human Development and allied areas.
3. To introduce students to principles of good scientific writing.
4. To enable in students the skills in selecting, computing, interpreting and reporting descriptive statistics.

	Course Content	Lectures
Unit I	**1 A. Introduction and Overview** (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 Human Development and related areas (e) Illustration of research in Human Development and allied areas (f) Qualitative versus quantitative research **1 B. The beginning steps in the research process** (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
Unit II	**2 A. Variables** (a) Definition (b) Characteristics (c) Types (d) Levels of measurement **2 B. Measurement** (a) Conceptual definitions and operational definitions (b) Types of validity and reliability in quantitative research **2 C. Data entry in quantitative research** (a) Codebook and mastersheet (b) Creating data files and data management	15
Unit III	**3. A. Introduction and overview to statistics** (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) **3 B. Descriptive Statistics for summarizing ratio level variables** (a) Frequencies and percentages (b) 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 Why? (inadequacy of the mean) Minimum value and maximum value Range Interquartile range Variance and standard deviation (e) Discrete and continuous variables (f) Histograms and line graphs	15
Unit IV	**4 A. Descriptive Statistics for summarizing nominal, ordinal and interval**	15

	level variables **4 B. Demonstration of computer software such as the Statistical Package for the Social Sciences (SPSS)** (a) Data entry (b) Data Management (c) Descriptive Statistics **4. C. Probability: Foundation of Advanced/Inferential Statistics** (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	

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Rubin, A., &Babbie, E. R. (2011). *Research methods for social work* (7th ed.). Belmont, CA: Thomson, Brooks/Cole.

Course Code	Title	Lectures/Week	Marks	Credits
PSHSII102	**Advanced Study of Theories of Behaviour and Development I**	**4**	**100**	**4**

Objectives

1. To have students construct advanced knowledge of the theories of human behaviour and development:
(a) comprehend the relevance of personal and societal events/contexts in the construction of a theory,
(b) analyse the major contributions of a theorist, and
(c) identify and address the major criticisms of a theory.
2. To develop in students an appreciation for primary literature.
3. To introduce the student to the latest theories of human behaviour and development.

	Course Content	Lectures
Unit I	**Introduction and Overview** a) Overview of the course b) Concepts/definitions of theories, models, paradigms c) Role of a theory in advancement of knowledge d) Process of theory development i. The role of the context in theory development ii. A theory as an evolving phenomenon: across the life-time of a founding theorist and across generations of scholars **Classic Theories of Development: The Psychodynamic Perspective** **Sigmund Freud** a) Relevance of socio-history (both personal and societal) in theory construction b) Overview of key concepts c) Advanced study of the unconscious (primary literature), the structure of the personality, and psychosexual development e) Psychoanalysis i. Role of the unconscious in psychoanalysis ii. Illustration using one of Freud's case histories (primary literature) f) Major criticisms; major contribution study	15
Unit II	**Classic Theories of Development: Breakaways from Freud** **Jungian/Analytical Psychology: Carl Gustav Jung** a) Relevance of personal and societal events/contexts in the construction of the theory (primary literature) b) Overview of key ideas c) The personal and impersonal/collective nature of human personality (the collective unconscious, ego, shadow, anima, animus, persona, archetypes) d) Advanced study of the Jungian perspective of the unconscious: the collective unconscious; related ideas such as synchronicity, significance of dreams, and, symbolism in art and religion (primary literature) e) Major criticisms; major contributions **Psychosocial Theory of Development: Erik Erikson** a) Relevance of personal and societal events/contexts in the construction of the theory (primary literature) b) Overview of key ideas c) The epigenetic chart and psychosocial stages (primary literature) d) Major criticisms; major contributions	15
Unit III	**Newer developments** **Revised Classic Theories of Development: Neo-Behaviorism** **Social-Cognitive Theory: Albert Bandura** a) Historical background: overview of classical and operant conditioning and major criticisms b) Role of context in theory development: context of changing paradigms c) Overview of key changes in Bandura's approach to human learning	15

	d) Major criticisms; major contributions **Contemporary Theories of Human Behaviour and Development: Bioecological Perspectives** **Urie Bronfenbrenner** a) Relevance of personal and societal events/contexts in the construction of the theory (primary literature) b) Defining properties of the bioecological model (primary literature) c) Microsystemic influences in development (primary literature) d) Beyond the microsystem (meso-, exo-, macro-systemic influences in development) (primary literature) e) Later extensions e) Major criticisms; major contributions	
Unit IV	**Contemporary Theories of Human Behaviour and Development: Life Span Approaches** **Life Span Theory: Paul B. Baltes and associates** (primary literature) a) Role of context in theory development b) Life-span theories: key concepts & principles i. Lifelong processes in development ii. Change and plasticity iii. Gain-loss dynamic; development as a process of selective adaptation; SOC iv. Culture as compensation v. Incomplete architecture of human development c) Five levels of analysis d) Major criticisms; major contributions **Life Course Theory: Glen H. Elder Jr.** (primary literature) a) Role of context in theory development b) Overview of key ideas with regard to life course theory i. Social pathways ii. Cumulative processes iii. Life trajectories iv. Turning points c) Principles of life course theory (primary literature) d) Major criticisms; major contributions	15

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Course Code	Title	Periods/ week	Marks	Credits
PSHSII103	**Advanced Study of Counselling and Psychological Testing I**	**4**	**100**	4

Objectives:

1. To introduce students to the advanced study of counselling and psychological testing.
2. To have students develop insights with regard to the counselling process, skills, approaches and applications.
3. To provide students with an overview of the field of psychological testing.
4. To have students construct advanced knowledge with regard to the various psychological tests of intelligence, aptitude, personality, and interest.

Course Content		Lectures
Unit I	**Introduction and Overview of counseling** a. Concept of counselling b. Characteristics of a helping relationship c. Core conditions of a helping relationship d. Personal characteristics of effective counsellors e. Stages in counselling • Initial Disclosure (attending, active listening) • In-depth exploration(questioning, theme identification, confrontation, immediacy, advanced empathy) • Commitment to action and termination (goal setting, action plans, termination, follow-up) f. Achieving a professional and personal identity g. Ethical issues in counselling	**15**
Unit II	**Counselling Approaches** a. Psychoanalytical b. Affective (Person-Centered, Gestalt) c. Cognitive – Behavioural (Rational-Emotive-Behavioural Therapy, Beck's Cognitive Therapy, Behavioural Counselling, Reality Therapy, Transactional Analysis) d. Solution–Focused Brief Counselling e. Crisis Intervention	**15**
Unit III	**Overview of the Field of Testing** a. Characteristics of psychological tests (reliability, validity, item analysis, test construction, test administration) b. Major contexts of test usage c. Selection of appropriate tests d. Reporting psychological assessment e. Ethics of psychological testing f. Future of psychological testing and relevance of computer-assisted assessment	**15**
Unit IV	**Assessment of Intelligence, Aptitude, Personality & Interest** a. Assessment of Intelligence and Creativity (e.g.,Binet scales, Wechsler's scales, Kaufman's Assessment Battery, Bayley's Scale of Infant Development, Torrance Tests of Creative Thinking) b. Assessment of Personality (EPPS, MBTI, Cattell's 16PF, Neo-Personality Inventory) c. Assessment of Interests and Aptitudes for Vocational Guidance (e.g., Strong Interest Vocational Blank, Kuder Occupational Interest Survey, Campbell Interest and Skill	**15**

	Survey, Holland's Self-Directed Search, Assessment of Career Development , Differential Aptitude Tests)	

References

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Course Code	Title	Lectures/Week	Marks	Credits
PSHSII104	**Research in Early Childhood, School, and Higher Education**	**4**	**100**	**4**

Objectives

1. To expose students to high quality research in early childhood, school, and higher (i.e., tertiary) education.
2. To build in students both appreciation and critical thinking skills related to extant research in early childhood, school, and higher education.
3. To help students construct advanced knowledge of early childhood education, school education, and higher education.

	Course Content	Lectures
Unit I	**Research in Early Childhood Education Part I** **1A. Research on efficacy of early childhood programs:** a) Efficacy of different types of early childhood programs; efficacy of different types of teaching-learning strategies in early childhood classrooms; anti-bias education **1B. Research on teacher development, teacher-student and teacher-parent relationships in early childhood:** a) Teacher professional development and impact on student learning outcomes in early childhood b) Teacher-student relationships in the early childhood classrooms c) Family engagement in early childhood programs; cocaring frameworks **1C. Research on the role of play in early development:** a) Threats to play in early childhood programmes; false dichotomy between play and learning; teacher instructional strategies and child play activities b) The complex role of pretend play in early childhood development c) The role of big body play in early childhood development; importance of natural spaces for play	15
Unit II	**Research in Early Childhood Education Part II** **2A. Research on language, cognitive, socio-emotional, and motor development in early childhood programs:** a) Facilitation of speech-language and literacy skills in early childhood classrooms; multilingualism, dual-language learning and speech-language competence in early childhood classrooms; best practices identified through research b) Cognitive development, science and mathematics in early childhood classrooms c) Socio-emotional development, motor development, music and movement, creative arts in early childhood classrooms **2B. Research on assessment, transition to school, ICT, and diverse cultural settings in early childhood programs:** a) Growth trajectories in early academic learning; assessment frameworks in early childhood care and education b) Transition to school; technology and digital media in the early years; research on early childhood education from diverse cultures	15
Unit III	**Research in School Education** **3A. Research on current status of the Indian and global school education systems** a) Current status of the Indian and non-Indian school education systems at different levels with respect to access, enrolment, retention, participation in school process and achievement b) Teachers, teacher training/education, and teacher qualifications c) Medium of instruction and languages taught d) Schooling facilities in rural/tribal areas vs. urban areas; schooling facilities for children with disabilities; alternative schooling; specific facilities in secondary and higher secondary schools **3B. Research on teaching of various subjects in the school:**	15

	a) Teaching of Indian languages and English b) Teaching of Mathematics, Science, and Social Science c) Teaching Art, Music, Dance and Theatre; Teaching Heritage Crafts d) Health and physical education in schools **3C. Research on Curriculum development** a) Curriculum, syllabus and textbooks b) Vocational education in schools; work and education c) Examination reform **3D. Research in issues in school education** a) Gender issues b) Problems of Scheduled Caste and Scheduled Tribe Children c) Use of educational technology d) Growth in school education in India and challenges	
Unit IV	**Research in Higher (i.e., Tertiary) Education** **4A. Introduction and history of higher education** a) Introduction; the logic of mass higher education; history in the world and India b) Western impact on Asian higher education; English as the dominating academic language c) Higher education systems in India and other countries **4B. Research on key concepts in higher education** a) Academic leadership, governance and management in higher education b) Principles and policy issues of college admissions c) Transforming teaching and learning in higher education; student retention and success in higher education; development in the college years; transforming students d) Demonstrating institutional effectiveness; higher education accreditation e) Academic remuneration and contracts: Global and local realities **4C. Research on challenges facing higher education in India and globally; possible solutions** a) The changing marketplace for higher education; understanding and shaping college mission, market and management; education sector non-profits; managing financial resources in non-profit organisations; public vs. private higher education b) Globalisation and higher education; higher education without borders; the global academic revolution c) Higher education in the digital age **4D. Research on issues in higher education** a) Diversity and equity in higher education; student engagement in higher education b) Academic freedom—realities and challenges; student political activism c) Future of higher education	15

References:

All India School Education Surveys (NCERT) and position papers on school education in India (NCERT)

Altbach, P. G. (2016). *Global perspectives in higher education*. John Hopkins University Press.

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Course Code	Title	Lectures/Week	Marks	Credits
PSHSIIP101	**Group Research Project I**	**3**	**50**	**2**

Objectives

1. To facilitate students in completing the initial steps of a group research project in Human Development and allied areas.
2. To help students learn how to execute the beginning steps of a research, namely: identifying a viable and worthwhile research topic, specifying the research purpose, and completing a review of literature.
3. To provide students with the experience of working in a research team.

	Course Content	Lectures
Unit I	**Preliminary steps in the research process: using multiple search strategies (Part I)** • Identifying leading scholarly journals (in the college library and through the Net): Which are the leading scholarly journals? Therefore, what are the broad areas of research related to Human Development? APA divisions that are applicable to Human Development • Reading the table of contents in nine journals (3 different journals x 3 volumes); articles in which areas are solicited in each such journal • Scanning dissertation topics; identifying focus areas with regard to dissertation topics; changes in dissertation topics over the years • Interviewing academicians/researchers/practitioners about salient/priority areas of research in Human Development and allied fields	15
Unit II	**Preliminary steps in the research process: using multiple search strategies (Part II)** • Visits to research centers in Mumbai • Identifying priority areas of research in Human Development • Identifying three areas of personal interest o Selecting dissertations that match these interests o Selecting research journal articles that match these interests o Experts' endorsement of such topics • Selecting one common area of interest to the group: starting a mini-research study o Summarising any three dissertations that match this interest o Summarising any three research papers that match this interest o Obtaining the perspective of any two experts on this topic o Finalising the research topic	15
Unit III	**Preliminary steps in the research process: the review of literature and statement of purpose** • Studying the review of literature in various dissertations and research articles and identifying key features of the content of literature reviews with the teacher • Studying the manner in which the research purpose is stated in dissertations and research articles o Examples from 3 dissertations o Examples from 3 research articles • Developing skills in paraphrasing (i.e., rewriting ideas in own words) and avoiding plagiarism (due acknowledgement to original source) • Collecting literature on chosen topic (resource file as submission) • Writing one-page summaries of each resource in the file • Making an outline of the review of literature; finalizing the outline • Putting together a PPT presentation on a literature review and statement of purpose; finalizing title, content of review of literature, & research purpose • Oral presentation of the literature review and purpose on chosen topic (PPT)	15

Methods: Students engage in multiple hands-on exercises in pairs or threes. The assigned teacher explains the value of each exercise and how to do each exercise. Students complete each exercise and submit their work. They obtain feedback about the relevance of that work in the research process and about the quality of their work. The mini research study is to be done in threes or in a group of four.

References:

Leong, F.T.L. & Austin, J. T. (Eds.) (1996). *The psychology research handbook.* New Delhi: Sage.

Leong, F.T.L. & Austin, J. T. (Eds.) (2006). *The psychology research handbook: A guide for graduate students and research assistants* (2nd ed.). Thousand Oaks, CA: Sage.

Course Code	Title	Lectures/Week	Marks	Credits
PSHSIIP102	**Early Childhood Education Practicum**	**4**	**50**	**2**

Objectives

1. To help students apply theoretical knowledge in practical situations.
2. To enable students to plan, implement and evaluate developmentally-appropriate educational and recreational activities for children.
3. To facilitate the development of classroom management skills in students.
4. To facilitate the development of event management skills in students.

	Course Content	Lectures
Unit I	**Introduction** a) Orienting students to various aspects of the ECCE placement. b) Input sessions on lesson planning and conducting different activities for preschool children. c) Developing skills in creating and composing stories and songs. d) Developing skills in creative storytelling. e) Developing skills in selecting art and craft activities for young children. f) Developing skills in selecting/creating games/transition activities for young children. **Observation of children** a) Developing a checklist and using it to observe children in the preschool setting.	15
Unit II	**Individual/Small Group lessons: Beginning Competencies** a) Planning and Implementing developmentally-appropriate lesson plans b) Evaluating Lessons (Self and Peers) c) Learning Classroom Management	15
Unit III	**Individual/Small group lessons: Advanced Competencies** a) Planning and Implementing developmentally-appropriate lesson plans b) Evaluating Lessons c) Learning Classroom Management	15
Unit IV	**Event Management** Planning and organizing a special event for one or more of the following: children, teachers, parents, and grandparents	15

Methods: Students are to be placed in a classroom in a preschool in Mumbai. Their placement is for one day a week and includes planning and evaluation meetings. Students are guided in their planning, conducting and evaluating developmentally-appropriate activities by the assigned faculty member.

Reference

Kostelnik, M. J., Soderman, A. K., Whiren, A. P., &Rupiper, M. L. (2014). *Developmentally appropriate curriculum: Best practices in early childhood educatio*n (6th ed.). New York, NY: Pearson.

Course Code	Title	Periods/ week	Marks	Credits
PSHSIIP103	**Counselling Practicum I**	**2**	**50**	2

Objectives

1. To facilitate in students a clearer understanding of themselves.
2. To get students to work on issues that may affect the effectiveness of their counselling.
3. To help students develop competencies in the microskills of counselling.
4. To provide an opportunity to students to apply these skills in an individual setting.
5. To help students develop skills in recording the counselling process.
6. To help students develop skills in reporting the counselling process**.**

Course Content		Periods
Unit I	**Awareness of Self** a) Understanding Self b) Identifying issues in self that could affect counselling c) Translating insights into real-life settings **Microskills in Counselling Part I** Developing basic counselling skills (building rapport, active listening, paraphrasing, reflection, questioning, summarizing, goal setting, creating comfortable closure, termination, referral)	**15**
Unit II	**Microskills in Counselling Part II** Developing advanced counselling skills (confrontation, advanced empathy, reframing, challenging self-destructive beliefs, using the "here and the now") **Reporting and recording counselling sessions** a) Recording counselling sessions (audiotape/videotape) b) Preparing transcripts c) Reporting sessions	**15**

Students are expected to do the following under the guidance and supervision of a faculty member:

1. Participate in self-awareness exercises prior to observing and conducting the counselling sessions.
2. Observe the faculty member conduct at least five sessions focusing on the microskills of counselling. Faculty member demonstrates how to do conduct the sessions.
3. Conduct five sessions of individual counselling in the classroom in the presence of the instructor (who observes and gives feedback).
4. Conduct three sessions outside the classroom and record the same.
5. Report the counselling sessions in a file.
6. Continuously work on personal issues that could affect the effectiveness of their counselling.

References

Egan. G. (2014). *The skilled helper. A problem management and opportunity development approach to helping*. Belmont, CA: Brooks/ Cole.

Nelson- Jones, R. (2016). *Counselling Skills: A helper's manual*. UK: Sage.

Course Code	Title	Periods/ week	Marks	Credits
PSHSIIP104	**Psychological Testing Practicum I**	**2**	**50**	2

Objective

To enable students to acquire competencies in the administration, scoring, and interpretation of selected psychological tests of personality, self-esteem/self-perception, aptitude and interest and measures of Learning disabilities and ADHD.

Course Content		Periods
Unit 1	**Assessment of Personality** a. Edward Personal Preference Schedule b. Children's Apperception Test c. Myers-Briggs Type Indicator d. Neo Personality Inventory **Assessment of Self-Esteem/Self-Perception** a. Rosenberg's Self-Esteem Scale b. Harter's Self-Perception Scales	**15**
Unit 2	**Vocational Assessment** a. Differential Aptitude Test b. Group Intelligence Test (NVTI/OTIS) **c.** Holland's Self-Directed Search **Assessment of Learning Disabilities and Attention–Deficit Hyperactive Disorder** a. Assessment of the skills of language, memory, perception, reading ,writing and mathematics for learning disabilities b. Assessment of ADHD (hyperactivity, impulsivity and inattention).	**15**

Methods:

a) Faculty member demonstrates and explains the administration, scoring and interpretation of each of the tests one-by-one.
b) Students administer at least each test on at least one participant under her guidance and supervision.
c) Students are expected to strictly follow the relevant manual instructions while administering, scoring and interpreting each of the above mentioned tests.
d) Students are expected to administer, score and interpret each of the above mentioned tests on at least three participants/clients.
e) Students have to maintain an individual file of the test administrations.

References

Manuals of the above-mentioned tests

M.Sc. (HOME SCIENCE) BRANCH II : HUMAN DEVELOPMENT

SEMESTER II

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods / week	Credits
PSHSII201	Research Methods and Statistics II	Theory	40	60	100	4	**4**
PSHSII202	Advanced Study of Theories of Human Behaviour and Development II	Theory	40	60	100	4	**4**
PSHSII203	Advanced Study of Counselling and Psychological Testing II	Theory	40	60	100	4	**4**
PSHSII204	Special Topics in Human Development: Health Psychology & Positive Psychology	Theory	40	60	100	4	**4**
PSHSIIP201	Group Research Project II	Practical	--	50	50	3	**2**
PSHSIIP202	Practicum in Other Human Development Agencies	Practical	--	50	50	4	**2**
PSHSIIP203	Counselling Practicum II	Practical	--	50	50	2	**2**
PSHSIIP204	Psychological Testing Practicum II	Practical	--	50	50	2	**2**
	TOTAL		**160**	**440**	**600**	**27**	**24**

Course Code	Title	Lectures/Week	Marks	Credits
PSHSII201	**Research Methods and Statistics II**	**4**	**100**	**4**

Objectives

1. To help students develop the skills needed in conducting a research in Human Development and allied areas.
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 advanced statistics.

	Course Content	Lectures
Unit I	**1 A. Sampling techniques in quantitative research** (a) Probability and nonprobability sampling methods in current use/examples from current research (b) Issues with regard to sampling techniques **I B. Research designs in quantitative research** Distinguishing between the following research designs; and, selecting research designs that are congruent with one's research purpose. (a) Experimental, quasi-experimental, and pre-experimental research designs; correlational research design Inferring causality, internal validity, external validity (b) Survey research design (c) Other research designs: Longitudinal versus cross-sectional; exploratory, descriptive, and explanatory; mixed methods	15
Unit II	**2A. Qualitative research methods** (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 **2B. Scientific writing** (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 **2 C. Ethics** (a) In academia (b) In research in general (c) In research with human subjects (d) In research with animal subjects	15
Unit III	**3 A. Prerequisite concepts needed for the use of advanced/inferential statistics** (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 **3 B. Using an advanced statistical method** (steps in using an advanced statistical method)	15
Unit IV	**4 A. To study statistics that allows us to contrast phenomena** (a) Univariate chi-square test (b) Bivariate chi-square test (c) t- or z- test for contrasting two independent groups (d) Paired t-test	15

	(e) one-way independent groups ANOVA **4 B. To study statistics that allows us to examine relationships between variables** (a) Bivariate chi-square test (b) Product-moment correlation coefficient **4 C. Ethics in the use of statistics** (e.g., the importance of test assumptions, the number of statistical tests in a research and levels of significance)	

References:

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

Denzin, N. K., & Lincoln, Y. S. (2011). *The Sage handbook of qualitative research.* Thousand Oaks, CA: Sage.

Fraenkel, J. R., &Wallen, N. E. (2006). *How to design and evaluate research in education* (6th ed.). New York, NY: McGraw-Hill.

Jackson, S. L. (2012). *Research methods and statistics: A critical thinking approach* (4th ed.). Wadsworth Cengage Learning.

Johnson, R. A., & Bhattacharyya, G. K. (2011). *Statistics: Principles and methods* (6th ed.). New York, NY: John Wiley.

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.

Kachigan, S. K. (1986). *Statistical analysis: An interdisciplinary introduction to univariate & multivariate methods.* Radius Pr.

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.

Leong, F.T.L. & Austin, J. T. (Eds.) (2006). *The psychology research handbook: A guide for graduate students and research assistants* (2nd ed.). Thousand Oaks, CA: Sage.

Lerner, R. M. (Series Ed.), & Overton, W. F., &Molenaar, P. C. M. (Volume Eds.). (2015). *Handbook of Child Psychology and Developmental Science, Vol. 1, Theory and method* (7th ed.). New York, NY: Wiley.

Rubin, A., &Babbie, E. R. (2011). *Research methods for social work* (7th ed.). Belmont, CA: Thomson, Brooks/Cole.

Course Code	Title	Lectures/Week	Marks	Credits
PSHSII202	**Advanced Study of Theories of Behaviour and Development II**	**4**	**100**	**4**

Objectives

1. To have students construct advanced knowledge of the theories of human behaviour and development:
(a) comprehend the relevance of personal and societal events/contexts in the construction of a theory,
(b) analyse the major contributions of a theorist, and
(c) identify and address the major criticisms of a theory.
2. To develop in students an appreciation for primary literature.
3. To introduce the student to the latest theories of human behaviour and development.

	Course Content	Lectures
Unit I	**Classic Theories of Development: Growth of Thought, Language and Morality (Part I)** **Cognitive Development: Jean Piaget** a) Role of context in theory construction b) Biological presuppositions and epistemological conclusions (primary literature) c) Illustration of the epigenetic point of view (primary literature) d) Advanced study of assimilation and accommodation (primary literature) e) Factors of development (primary literature) f) Stages of cognitive development g) Major criticisms; major contributions	15
Unit II	**Classic Theories of Development: Growth of Thought, Language and Morality (Part II)** **Language and Thought: Lev S. Vygotsky** a) Role of context in theory construction b) Development of thought and language c) Key generalizations about development d) Major criticisms; major contributions **Moral Development: Lawrence Kohlberg** a) Role of context in theory construction b) Overview of key ideas c) Stages of moral development d) Major criticisms; major contributions stages (primary literature)	15
Unit III	**Contemporary Theories of Human Behaviour and Development: Systems Approaches** **Introduction to Systems Theories** Mechanistic vs. Organismic/Systems Views Key concepts integral to systems views **Dynamic Systems Theory: Esther Thelen and Linda B. Smith** (primary literature) a) Role of context in development of Dynamic Systems Theories b) Key ideas in Dynamic Systems Theories c) Principles of development d) Major criticisms; major contributions **Dynamic Systems Theory: David C. Witherington** a) Extensions of Dynamic Systems Theory i. Contextualism; organicism ii. Circular Causality; reciprocal nature of structure-function relationships iii. Emergence through self-organisation	15
Unit IV	**Contemporary Theories of Human Behavior and Development: Other New Approaches** **Action Perspectives: JochenBrandtstädter**(primary literature) a) Role of context in development of action theories b) Key ideas in Action Theories of development c) Personal regulation of developmental processes d) The concept of action e) Intentional self-development and personal control over development	15

	f) Major criticisms; major contributions **The Development of Agency: Bryan W. Sokol, Stuart I. Hammond, Janet Kuebli, and Leah Sweetman** a) Key concepts in the development of agency **Positive Youth Development: Peter L. Benson, Richard Lerner, Jacqueline Eccles, William Damon and associates** (primary literature) a) Role of context in theory development b) Positive Youth Development Theory: Key ideas c) Major criticisms; major contributions	

References:

Baldwin, A. (1980). *Theories of human development*. New York, NY: Wiley.

Damon, W. (Series Ed.) & Lerner, R. M. (Vol. Ed.). (2006). *Handbook of child psychology. Volume one: Theoretical models of human development.* New York, NY: John Wiley.

Green, M. (1989). *Theories of human development: A comparative approach*. New Jersey: Prentice Hall.

Lerner, R. M. (2001). *Concepts and theories of human development.* Psychology Press.

Lerner, R. M. (Series Ed.), & Overton, W. F., &Molenaar, P. C. M. (Volume Eds.). (2015). *Handbook of Child Psychology and Developmental Science, Vol. 1, Theory and method* (7th ed.). New York, NY: Wiley.

Mussen, P. H. (Ed.). (1983). *Handbook of Child Psychology.Vol.1: History, theory and methods*. New York, NY: Wiley.

Piaget, J. (1970/1983). Piaget's theory. In P. H. Mussen (Ed.), *Handbook of Child Psychology. Vol.1: History, theory, and methods.* New York, NY: Wiley.

Thomas, M. (2000). *Comparing theories of child development* (5th ed.). Belmont, CA: Wadsworth.

Course Code	Title	Periods/ week	Marks	Credits
PSHSII203	**Advanced Study of Counselling and Psychological Testing II**	**4**	**100**	4

Objectives

1. To have students develop insights with respect to areas of child and adolescent counselling and in particular counselling children with special concerns.
2. To familiarize students with different areas of adult counselling and issues of human diversity in counselling.
3. To have students construct advanced knowledge with respect to assessment of individuals with impairments/handicaps/ disabilities.
4. To sensitize students to assessment in clinical and healthcare settings.

Course Content		Lectures
Unit I	**Specialized areas of counselling – Part 1** a. Child & Adolescent counselling (play therapy, group counselling, school counselling, college counselling, career counselling) b. Counselling children and youth with special concerns (addiction counselling; children of alcoholics, divorce, single-parent families; children experiencing death and bereavement; children with disabilities)	**15**
Unit II	**Specialized areas of counselling – Part 2** a. Adult counselling (marriage, family and sex counselling; parent counselling; workplace counselling; counselling for mid-life issues; counselling older adults) b. Issues of human diversity in counselling (counselling clients of different genders, socioeconomic strata, sex orientations, religions)	**15**
Unit III	**Assessment of Special Populations** a. Visually Impaired and Blind b. Hearing Impaired and Deaf c. Motor Disabled d. Learning Disabled e. Mentally handicapped	**15**
Unit IV	**Assessment in Clinical and Healthcare settings** a. Assessment of Child and Adult Adjustment, Anxiety, Self-esteem and Depression (e.g., MMPI, Child Behavior Checklist, Harter's Self-Esteem Scale, Beck's Depression Inventory, Neuropsychological Assessment for the Geriatric population) b. Projective tests in Clinical Practice (e.g., Rorschach, TAT, CAT, Sentence Completion tests, Drawing tests) c. Types of Assessment in Healthcare settings (Anxiety Scales, Test Anxiety Scales, Life Experience Survey, Quality of Life, Marriage and Family functioning, Measures of Coping, Measures of Social Support)	**15**

References

Capazzi, D., & Cross, D. (2014). *Counselling and psychotherapy: Theories and interventions*. New Jersey: Prentice –Hall.
Corey, G. (2016). *Theory and practice of counselling and psychotherapy*. Connecticut: Cengage learning.

Gehart, D. (2012). *Theory and treatment planning in counselling and psychotherapy*. Connecticut: Cengage learning.
Groth-Marnat, G., & Jordan-Wright , A. (2016). *Handbook of psychological assessment* (6thed). New York, NY: Wiley.
Hays, D.G. (2014). *Assessment in counselling . A guide to the assessment of psychological assessment procedures*. New York, NY: Wiley.
Neukrug, E. S. (2015). *The sage encyclopedia of theory in counselling and psychotherapy*. Thousand Oaks, CA: Sage.
Neukrug, E.S., & Fawcett, C. (2014). .*Essentials of testing and assessment: A practical guide for counselors , social workers and psychologists*. Connecticut: Cengage Learning.

Course Code	Title	Lectures/Week	Marks	Credits
PSHSII204	**Special Topics: Health Psychology & Positive Psychology**	**4**	**100**	**4**

Objectives

1. To introduce students to special topics in Human Development and allied areas: namely, Health Psychology and Positive Psychology.
2. To facilitate students in constructing their knowledge of the key concepts in Health Psychology and Positive Psychology.

	Course Content	Lectures
Unit I	**Health Psychology Part I** **1A. Introduction to Health Psychology & Health Beliefs** a) What is health psychology; focus and aims of health psychology b) Health inequalities c) Role of health beliefs in predicting health behaviours; intention-behaviour gap d) Theoretical perspectives • Attribution theory • Risk perception and self-affirmation theory • Motivation and self-determination theory • Self-efficacy • Stage models: stages of change model; health action process approach (HAPA); social cognition models **1B. Health Behaviours** a) Eating behaviour • Diet and health • Developmental, cognitive, and weight concern models of eating b) Exercise • Contemporary concern with exercise behaviour; • Factors predicting exercise • Improving exercise behaviour; exercise adherence and relapse c) Sex • Biological functions of sex; sex as risk to health, including in the context of STDs/HIV and AIDS; sex and wellbeing • Developmental and decision-making models • LGBT community **1C. Health promotion: Changing health behaviours** a) Learning and cognitive theories, social cognition theory, stage models; changing affect b) Modern technologies; media (negative influence, resource for positive change, media campaigns) c) Sustained behaviour change	15
Unit II	**Health Psychology Part II** **2A. Becoming Ill** a) Illness cognitions; Leventhal's self-regulatory model of illness behaviour b) Accessing healthcare • Health care systems: primary and secondary • Help seeking and delay • Screening; adherence; patient-practitioner interactions c) Stress and illness • The development of stress models; psychological factors; transactional model of stress • Appraisal, self-control; changes in physiology: stress reactivity, stress recovery, allostatic load, stress resistance; interaction between physiological and psychological aspects of stress • How does stress cause illness; individual variability in the stress-illness link; psychoneuroimmunology • Chronic stress: job stress, relationship stress	15

	• Coping, social support, personality, and control **2B. Being ill** a) Pain • Early pain theories, psychological factors, gate control theory of pain, psychosocial factors in pain perception, subjective-affective-cognitive processes • Psychology in pain treatment b) Psychology through the course of illness • HIV and AIDS/Cancer/Diabetes/Chronic kidney disease • Obesity and coronary heart disease c) Gender issues in health d) Measurement of health status: Mortality to quality of life e) Critical health psychology	
Unit III	**Positive Psychology Part I** **3A. Introduction** a) History and foundations of Positive Psychology b) Character strengths, values, virtues; resilience **3B. Cognitive approaches** a) Dispositional optimism, learnt optimism, health benefits b) Hope c) Mindfulness d) Self-efficacy & self-determination **3C. Emotional approaches** a) Happiness, subjective well-being, hedonic capacity b) Understanding and developing positive emotions/positive affectivity (broaden and build theory; other theories), affective forecasting, benefits of negative emotions c) Emotional intelligence d) Emotional creativity	15
Unit IV	**Positive Psychology Part II** **4A. Interpersonal approaches** a) Forgiveness b) Gratitude, altruism c) Love, compassion, kindness, goodness, empathy **4B. Neuroscience approaches** a) Positive neuroscience **4C. Applications** a) Positive education b) Positive aging c) Positive parenting d) Positive health e) Positive workplace; innovation and leadership through positive psychology	15

References:

Ogden, Jane. (2012). *Health psychology: A textbook* (5th ed.). New Delhi: McGraw Hill, Open University Press.

Snyder, C. R., & Lopez, S. J. (Eds.). (2009). *Oxford handbook of positive psychology* (2nded.). New York, NY: Oxford University Press.

Course Code	Title	Lectures/Week	Marks	Credits
PSHSIIP201	**Group Research Project II**	**3**	**50**	**2**

Objectives

1. To facilitate students in completing the middle and final steps of a group research project in Human Development and allied areas.
2. To help students learn how to execute the middle and final steps of a research, namely: selecting/constructing tools, data collection, data analysis, and reporting results.
3. To provide students with the experience of working in a research team.

	Course Content	Lectures

Unit I	**Middle steps in the research process (Part I):** Designing the methods of own group research project
	• Tools
	  o Reviewing relevant tools
	  o Selecting, adapting available tools
	  o Constructing tools
	  o Piloting tools
	  o Obtaining expert feedback
	• Making decisions about sample size, sample characteristics, and sampling techniques
	• Feasibility checks; obtaining consent from relevant organisations and potential participants
		15

Unit II	**Middle steps in the research process (Part II):**
	• Data collection
	• Data entry
	  o Quantitative data entry: SPSS
	  o Identifying qualitative analysis areas
		15

Unit III	**Latter steps in the research process:**
	• Data analysis
	  o Quantitative
	  o Qualitative
	• Making and finalising an outline of the results
	• Putting together a PPT presentation on the group research project with the final title and the research purpose as well as:
	  o Sampling, sample size, sample characteristics
	  o Measurement
	  o Key findings
	  o Brief discussion
	• Oral presentation of the methods and results of the group research project (PPT)
		15

Methods: Students engage in multiple hands-on exercises in pairs or threes. The assigned teacher explains the value of each exercise and how to do each exercise. Students complete each exercise and submit their work. They obtain feedback about the relevance of that work in the research process and about the quality of their work. The mini research study is to be done in threes or in a group of four.

References:

Leong, F.T.L. & Austin, J. T. (Eds.) (1996). *The psychology research handbook.* New Delhi: Sage.

Leong, F.T.L. & Austin, J. T. (Eds.) (2006). *The psychology research handbook: A guide for graduate students and research assistants* (2nd ed.). Thousand Oaks, CA: Sage.

Course Code	Title	Lectures/Week	Marks	Credits
PSHSIIP202	**Practicum in Other Human Development Agencies**	**4**	**50**	**2**

Objectives

1. To help students apply theoretical knowledge in practical situations.
2. To provide students with hands-on experiences in Human Development agencies other than preschools (i.e., counselling centres, NGOs, corporate sector, schools).

	Course Content	Lectures
Unit I	**Introduction** a) Orienting students to different Human Development (HD) agencies. b) Collecting information on possible placement opportunities in HD agencies. • Visits • Web-based information • Phone calls/emails c) Completing feasibility checks and finalising placement in an approved HD agency in pairs. **Placement in an HD agency: Beginning Competencies (Part I)** a) Observing processes in the HD agency in which placed. b) Making a report of the organisational structure and functioning	15
Unit II	**Placement in an HD agency: Beginning Competencies (Part II)** a) Completing simple-level assignments or tasks given by site supervisors b) Making a report of the assignments/tasks	15
Unit III	**Placement in an HD agency: Advanced Competencies** a) Completing advanced-level assignments or tasks given by site supervisors b) Making a report of the assignments/tasks	15
Unit IV	**Conducting a workshop on a relevant theme at the HD agency in which placed** a) Planning and organizing a workshop on a relevant theme b) Implementing and evaluating the workshop	15

Methods: Students are to be placed in pairs at an HD agency in Mumbai such as NGOs, counselling centres, companies etc. Their placement is for one day a week and includes meetings with faculty supervisor and site supervisors. Students are guided in their planning, conducting and evaluating appropriate assignments including the workshop by the assigned faculty member along with the site supervisors.

Course Code	Title	Periods/ week	Marks	Credits
PSHSIIP203	**Counselling Practicum II**	**2**	**50**	2

Objectives:

1. To help students develop competencies in using diverse approaches of counselling.
2. To provide an opportunity to students to apply these approaches in an individual setting.
3. To help students develop skills in recording the counselling process.
4. To help students develop skills in reporting the counselling process.

Course Content		Periods
Unit I	**Approaches to Counselling Part I** Solution Focused Brief Counselling Behavioural therapy Cognitive-behavioural Therapy • R.E.B.T. • Beck's Cognitive Therapy	**15**
Unit II	**Approaches to Counselling Part 2** Transactional analysis Client-Centered Therapy and the Carkhuff Model Reality Therapy Gestalt Therapy	**15**

Students are expected to:

1. Observe the faculty member conduct at least three sessions of each counselling approach.
2. Conduct two sessions of each counselling approach in the classroom in the presence of the instructor (who observes and gives feedback).
3. Conduct two sessions outside the classroom and record it.
4. Report the counselling sessions in a file.
5. Attend at least one workshop that focusses on counselling approaches.
6. Continuously work on personal issues that could affect the effectiveness of their counselling.

References

Egan. G. (2014). *The skilled helper. A problem management and opportunity development approach to helping.* Brooks/ Cole: CA.

Nelson- Jones, R. (2016). *Counselling Skills: A helper's manual*. UK: Sage.

Course Code	Title	Periods/ week	Marks	Credits
PSHSIIP204	**Psychological Testing Practicum II**	**2**	**50**	2

Objectives

To enable students to acquire competencies in the administration, scoring and interpretation of selected psychological tests of intelligence, creativity, adjustment, anxiety and depression.

Course Content		Periods
Unit 1	**Intelligence, Developmental and Creativity Assessment** a. Wechsler's Intelligence Scale for School Children. b. Developmental Assessment Scale for Indian Infants. c. Kaufman's Assessment Battery. d. Torrance/Passi's Tests of Creativity.	**15**
Unit 2	**Assessment of Adjustment, Anxiety and Depression** a. Achenbach's Child Behavior Checklist. b. State Trait Anxiety Inventory. c. Beck's Depression Inventory.	**15**

Methods:

a) Faculty member demonstrates and explains the administration, scoring and interpretation of each of the tests one-by-one.
b) Students administer at least each test on at least one participant under her guidance and supervision.
c) Students are expected to strictly follow the relevant manual instructions while administering, scoring and interpreting each of the above mentioned tests.
d) Students are expected to administer, score and interpret each of the above mentioned tests on at least three participants/clients.
e) Students have to maintain an individual file of the test administrations.

References

Manuals of the above-mentioned tests.

UNIVERSITY OF MUMBAI

Syllabus

SEMESTER I & SEMESTER II

Program: M.Sc.

Course: Home Science

Branch III: Textile and Fashion Technology

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

M.Sc. (HOME SCIENCE) BRANCH III : TEXTILE AND FASHION TECHNOLOGY

SEMESTER I

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods / week	Credits
PSHSIII101	Research Methods and Statistics I	Theory	40	60	100	4	**4**
PSHSIII102	Global Merchandising	Theory	40	60	100	4	**4**
PSHSIII103	Natural Fiber Science	Theory	40	60	100	4	**4**
PSHSIII104	Textile & Garment Finishing	Theory	40	60	100	4	**4**
PSHSIIIP101	Home Textiles - Designing & Product Development	Practical	--	50	50	4	**2**
PSHSIIIP102	Pattern Making, Grading and Garment Construction- Women's Wear	Practical	--	50	50	4	**2**
PSHSIIIP103	Value addition through Finishes - Textile and Garment	Practical	--	50	50	4	**2**
PSHSIIIP104	CAD- Textile & Fashion Illustration and Design Development	Practical	--	50	50	4	**2**
	TOTAL		**160**	**440**	**600**	**32**	**24**

The candidate is required to submit the certificate of completing One Year Diploma course in : "CAD, CAM and Computer Technologies in the Apparel Industry"before completion of M.Sc. (Home Science) course.

Course Code	Title	Periods/ week	Marks	Credits
PSHSIII101	**RESEARCH METHODS AND STATISTICS I**	**4**	**100**	**4**

Objectives :

1. To build in student's appreciation for high quality research in each of their specializations.
2. To introduce students to the skills needed in conducting a research in their specialization.
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
UNIT I	**1 A. Introduction and Overview** 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 **1 B. The beginning steps in the research process** . (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**
UNIT II	**2 A. Variables** (a) Definition (b) Characteristics (c) Types (d) Levels of measurement **2 B. Measurement** (a) Conceptual definitions and operational definitions (b) Types of validity and reliability in quantitative research 2 C. Data entry in quantitative research (a) Codebook and mastersheet (b) Creating data files and data management	**15**
UNIT III	**3.A. Introduction and overview to Statistics** (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) **3 B. Descriptive Statistics for summarizing ratio level variables** (a) Frequencies and percentages (b) 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 Why? (inadequacy of the mean) Minimum value and maximum value Range Interquartile range Variance and standard deviation (e) Discrete and continuous variables (f) Histograms and line graphs	**15**

UNIT IV	**4 A. Descriptive Statistics for summarizing nominal, ordinal and interval level variables** **4 B. Demonstration of computer software such as the Statistical Package for the Social Sciences (SPSS)** (a) Data entry (b) Data Management (c) Descriptive Statistics **4. C. Probability: Foundation of Advanced/Inferential Statistics** (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	**15**

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Course Code	Title	Periods/week	Marks	Credits
PSHSIII102	**GLOBAL MERCHANDISING**	**4**	**100**	**4**

Objectives:
1. To provide knowledge of international trade.
2. To impart knowledge of marketing and merchandising.

Course Content		Periods
Unit I	**Information Technology for Merchandising** i. Quick response business systems: ii. Customer driven systems (POS) iii. Universal product code (UPC) iv. E-commerce, (ERP), Enterprise Resource Planning v. Electronic data interchange (EDI) vi. Smart labels and Radio frequency identification vii. Time based competition, Agility, Partnering (external and internal)	**15**
Unit II	**Merchandising systems** i. Business to business relationships-wholesaling, ii. Business to ultimate consumer transactions- retailing iii. Line planning: evaluating merchandising mix and forecasting offerings, Merchandise budgets and assortment plans, delivery and allocation plans iv. Determining the length of selling periods: timing merchandising calendars (selling and transition periods) v. Forecast based merchandise plans (regional and local economic and cultural influences during the period trend and end of period trend analysis) vi. Line development: Line concept/ finished goods buying/ sourcing, product development (creative design, line adoption, technical design) vii. Line presentation: internal line presentation, wholesale online presentation and retail line presentation **Dimensions of planning product lines** i. Pricing dimensions ii. Assortment dimensions: Merchandise assortment, SKU stock keeping unit **Line development and computer technology:** CAD systems, PDS, PIMS, Videoconferencing, Customization: Body scanning, Interactive on-line fashion information services, Web based data management systems	**15**
Unit III	**Role & responsibilities of a merchandiser, Market Knowledge and four P's** **Market Segmentation** i. Factors for segmentation: Demographic trends, psychographics, social force, government influences, economic trends ii. Market penetration and development iii. Product development and diversification **Strategic Planning** Definition, Marketing calendar, Line preview date, Critical path method, Line plan summary, Sales forecast, Shelf stock plan, Style status report, Order tracking **Traditional & Contemporary line planning**	**15**
Unit IV	**Quality assurance** i. Definition and importance of quality management ii. Consumers' perception of quality, company responsibility iii. Deming's 14 points, Juran's 10 steps to quality improvement, Sigma six strategy iv. Standards and specifications.	**15**

	v. Quality determinants (raw materials, pattern and fit, construction) vi. Quality and sampling procedures vii. Statistical Process Control (SPC) viii. Merchandise Checking procedures: Quantity checking and quality controllers, Marking merchandise, Loss prevention: Shoplifting, Deterrents and controls, Electronic Article Surveillance (EAS) **Merchandising perspectives on pricing** Income statements, Pricing and costing, Pricing Strategies, Pricing variables, Pricing relationships and strategic pricing, Components of pricing strategies, Costing principles and strategies, Types of costing	

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Course Code	Title	Periods/week	Marks	Credits
PSHSIII103	**NATURAL FIBER SCIENCE**	**4**	**100**	**4**

Objectives:

1. To study the morphology, chemical constitution and manufacturing processes of natural fibers.
2. To study physical and chemical properties and end uses of cellulosic and proteinic fibres.

Course Content		Periods
Unit I	**Cellulose fibers- Chemistry** a) Chemistry of cellulose: Chemical composition and constitution b) Reactivity of different hydroxyl groups, Hydrolysis and oxidation of cellulose, estimation of the extent of degradation	**15**
Unit II	**Natural Cellulosic fibres- Physics** Morphology, fine structure, properties, and varieties of cellulosic fibers including Indian varieties. a) Cotton b) Jutec) Flax	**15**
Unit III	**Proteinic fibers** a) Chemistry of proteins- chemical composition and constitution of proteins, functional groups, properties conferred by the nature of substituent b) Morphology and histology of wool and silk, types of bonds present in wool (including Indian varieties) and silk, Indian variety of wool and silk, properties	**15**
Unit IV	**Ecological concerns** in manufacturing and processing of natural fibers **Recent developments** in natural fibers	**15**

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Course Code	Title	Periods/week	Marks	Credits
PSHSIII104	**TEXTILE AND GARMENT FINISHING**	**4**	**100**	**4**

Objectives:

1. To study about the chemicals used in textile finishing, along with the essential properties of raw materials used in their manufacture and application.
2. To study the recent developments in various finishing processes.

Course Content		**Periods**
Unit I	Introduction to and classification of textile auxiliaries, concept of water surface activity, hydrophilic and lyophilic balance. Chemical finishing processes	**15**
Unit II	Cationic, anionic and nonionic surfactants, soaps.	**15**
Unit III	**Current textile garment finishing in use:** Softening finish, stiffening finish, easy care / durable press finish, water repellent and water proof finish, soil release finish, non slip finish, finishing with enzymes. Various chemicals and method used in obtaining these finishes, their mode and mechanism of reaction, effect on various fabric and fabric properties. Eco concerns of the finishes.	**15**
Unit IV	**Current textile garment finishing in use:** Flame retardant finish, anti-static finish, anti-pilling finish, UV protection finish, antimicrobial and anti fungal finish Various chemicals and method used in obtaining these finishes, their mode and mechanism of reaction, effect on various fabric and fabric properties. Eco concerns of the finishes. **Future trends in chemical finishing**	**15**

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Course Code	Title	Periods/week	Marks	Credits
PSHSIIIP101	**HOME TEXTILES- DESIGNING AND PRODUCT DEVELOPMENT**	**4**	**50**	**2**

Objectives:

1. To acquaint students to advance techniques of pattern making for different products and styles of home made-ups.
2. To adapt constructed blocks to the given patterns and grading according to different sizes.
3. To familiarize students with various techniques of finishing.
4. To acquaint students with the skill of handling different materials and patterns.
5. Identification, analysis and selection of different types of fabrics for particular end-uses.
6. Layout of drafts on fabric and its cutting

Course Content		Period
Unit I	Drafting of various made-ups- for bedroom, living room, kitchen, bathroom	**15**
Unit II	Construction of Bedroom & living room products- classification of oriental and contemporary rugs, Floor covering, Bed linen, carpets, curtains, bedlinen, its availability in the market, Use & care of floor coverings, curtains, bed linen etc Making products using hand and machine embroidery using old and new material	**15**
Unit III	Construction of kitchen and bathroom products- Table Linen & Bath Linen, Kitchen towels & napkins,Different types of fabric used, Different sizes, Use & care of table and bath linen , Making products using hand and machine embroidery using old and new material	**15**

Portfolio Presentation

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Course Code	Title	Periods/week	Marks	Credits
PSHSIIIP102	**PATTERN MAKING, GRADING AND GARMENT CONSTRUCTION – WOMEN'S WEAR**	**4**	**50**	**2**

Objectives:

1. To acquaint students to advance techniques of pattern making for different styles of clothing for women.
2. To adapt constructed blocks to the given patterns and grading according to different sizes.
3. To familiarize students with various techniques of apparel making.
4. To acquaint students with the skill of handling different materials and patterns.
5. Identification, analysis and selection of different types of fabrics for particular end-uses.
6. Layout of drafts on fabric and its cutting

Course Content		Periods
Unit I	A. Basic Block Construction (a) Adult's Basic Block, Sleeve, Torso block (b) Displacements of darts Concealments of darts (c) Drafting of yokes, gathers, pleats for upper and lower garments, collars (Shirt, Reversible, Shawl, Danton, Chinese) B. Drafting of sleeves (Dolman, Raglan, Kimono, Magyar) C. Drafting and adapting patterns (along with draft instructions and markings) using anthropometric measurements and grading of upper block D. Drafting and adapting patterns (along with draft instructions and markings) using anthropometric measurements and grading of lower block	**15**
Unit II	Upper Garments: Choli, Kurta/Angarakha, Partywear/Western Outfit- any two	**15**
Unit III	Lower Garments: Chudidar, Designer salwar, Skirts/trousers/culottes- any two	**15**

- Construction of the above garments using plackets (Kurta/double shirt placket/continuous Kurta), collars (Reversible/Chinese/ Shawl and Danton, yokes (T-/ U-/Straight) and gussets (simple/ sleeve/ strip), pockets (side seam pocket/velt pocket/ bound pocket/ front pant pocket) zips (with seam/ invisible zip/ zip with fly).
- Portfolio Presentation

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Course Code	Title	Periods/week	Marks	Credits
PSHSIIIP103	**VALUE ADDITION THROUGH FINISHES– TEXTILE AND GARMENT**	**4**	**50**	**2**

Objectives :

1. To experiment with the chemicals used in textile finishing, along with the essential properties of raw materials used in their manufacture and application.
2. To experiment with the chemicals used in denim washing, along with the essential properties of raw materials used in their manufacture and application.
3. To experiment with the recent chemicals and methods used in various finishing processes.
4. To experiment with chemicals and methods used in various fabrics for textile finishing
5. Portfolio & Journal

Course Content		Periods
Unit I	Value addition through chemical finishes- functional- softening, antimicrobial, hydrophilic, water proof, soil release, etc. using environmental friendly chemicals and reagents on various fabric types	**15**
Unit II	Value addition through chemical finishes- denim washing using environmental friendly chemicals and reagents on various fabric types	**15**
Unit III	Testing and evaluation of above finishes relevant to each	**15**

Portfolio/Journal Presentation

References

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Course Code	Title	Periods/week	Marks	Credits
PSHSIIIP104	**CAD- TEXTILE & FASHION ILLUSTRATION AND DESIGN DEVELOPMENT**	**4**	**50**	**2**

Objectives:

1. To enhance the creative skills of drawing, sketching and rendering colours for designing prints, weaves, knits, garments and accessories based on themes.
2. The above ensembles to include designs in sleeves, collars, necklines, bodices, bifurcated wear, outer wear
3. To familiarize students with design process
4. Portfolio & Journal

Course Content		Periods
Unit I	Design Development for rotary and digital printing of textile designs for apparel and home furnishings- Inspiration, Forecast boards, Technical drawings and Presentation of Design sheets using CAD Demonstrations of printing software's in computer applications	**15**
Unit II	Design Development for weave and knit designs for apparel and home furnishings- Inspiration, Forecast boards, Technical drawings and Presentation of Design sheets using CAD Demonstrations of weave and knit designing software's in computer applications	**15**
Unit III	Design development for women's, men's and kids apparel and accessries- Inspiration, Forecast boards, Technical drawings and Presentation of Design sheets using CAD Demonstrations of apparel designing software's in computer applications	**15**

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M.Sc. (HOME SCIENCE) BRANCH III : TEXTILE AND FASHION TECHNOLOGY

SEMESTER II

Course Code	Title	Theory/ Practical	Internal Marks	Semester End Exam	Total Marks	Periods / week	Credits
PSHSIII201	Research Methods and Statistics II	Theory	40	60	100	4	**4**
PSHSIII202	Global Marketing and Entrepreneurship	Theory	40	60	100	4	**4**
PSHSIII203	Regenerated and Synthetic Fiber Science	Theory	40	60	100	4	**4**
PSHSIII204	Technical Textiles	Theory	40	60	100	4	**4**
PSHSIIIP201	Accessory Making and Product Development	Practical	--	50	50	4	**2**
PSHSIIIP202	Pattern Making, Grading and Garment Construction- Men's Wear	Practical	--	50	50	4	**2**
PSHSIIIP203	Value addition through Dyeing and Printing	Practical	--	50	50	4	**2**
PSHSIIIP204	Fashion Photography and Visual Merchandizing	Practical	--	50	50	4	**2**
	TOTAL		**160**	**440**	**600**	**32**	**24**

The candidate is required to submit the certificate of completing One Year Diploma course in : "CAD, CAM and Computer Technologies in the Apparel Industry" before completion of M.Sc. (Home Science) course.

Course Code	Title	Periods/ week	Marks	Credits
PSHSIII201	RESEARCH METHODS AND STATISTICS II	4	100	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		Periods
Unit I	**1 A. Sampling techniques in quantitative research** . (a) Sampling methods in current use/examples from current research . (b) Issues with regard to sampling techniques **I B. Research designs in quantitative research** 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
Unit II	**2 A. Qualitative research methods** **(**a) Ideology/worldview of the qualitative researche**r** (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 **2B. Scientific writing** . (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 . (e) Reporting statistical findings in text **2 C. Ethics** . (a) In academia . (b) In research in general . (c) In research with human subjects . (d) In research with animal subjects	15
Unit III	**3 A. Other concepts needed for the use of advanced/inferential statistics** (a) Types of distribution Frequency distribution Normal distribution Probability distribution Sampling distribution (b) Type I and type II errors (c) (c) Central limit theorem (d) Point estimation vs. interval estimation (e) Standard error (and confidence intervals) (f) Parametric and nonparametric methods **3 B. Using an advanced statistical method** (steps in using an advanced statistical method)	15
Unit IV	**4 A. To study statistics that allows us to contrast phenomena** (a) Univariate chi-square test (b) Bivariate chi-square test (c) t- or z- test for contrasting two independent groups (d) Paired t-test (e) ANOVA **4 B. To study statistics that allows us to examine relationships between variables** (a) Bivariate chi-square test (b) Product-moment correlation coefficient **4 C. Ethics in the use of statistics** (e.g., the importance of test assumptions, the number of statistical tests in a research and levels of significance)	15

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Course Code	Title	Periods/ week	Marks	Credits
PSHSIII202	**GLOBAL MARKETING AND ENTREPRENEURSHIP**	**4**	**100**	**4**

Objectives

1. To equip students with the knowledge of the fashion world.
2. To provide knowledge of international trade.
3. To impart knowledge of marketing and merchandising.
4. To enhance entrepreneur skills.

Course Content		Periods
Unit I	**Language of fashion and textile design** i. Definition and nature of Fashion Business ii. Principles of Fashion iii. Terminology: Style, Fashion (high and mass fashion), Design, Taste, Classic, Fad, Trend, any others iv. Components of Fashion/Design Elements & Principles: v. Fashion Cycle vi. Movement and Theories of fashion vii. Fashion forecast and fashion shows **Leading international designers and their labels Organization and operation of the fashion business**: Women's wear, menswear, children's wear, fashion accessories, home fashions	**15**
Unit II	**Merchandise planning, buying and control.** i. Merchandise distribution ii. Service quality, servicing customers in on-site and offsite ventures iii. Personal Selling: Characteristics of sales associate, Sales presentation **Advertising and promotion** i. Classifications of Fashion advertisements ii. Media iii. Promotional programs and Publicity iv. Off-site retailing: E-tailing Advantages v. Process (creating a web-site Design development and web-site specifications) vi. Classification of E-tailers vii. Catalogs	**15**
Unit III	**Market Research** i. Basic, Applied (consumer, product, market analysis) ii. Consumer research: Demographics and psychographics iii. Product research: preferred product design and characteristics iv. Market analysis: long range and short range forecasting **Fashion research** i. Fashion trend research ii. Color research iii. Fabric and trim research iv. Line plan & styling direction. v. Nature of retailing research and the research process **Data Collection** i. Methods for data collection ii. Focus groups, Mall intercepts consumer panels, mail & telephone surveys, point of sale data, corporate sales records, Web sites. iii. Industry information sources: Trade shows, trade publications **Fashion Retailing** i. Definition of retailing terms ii. Types of retailing and multichannel fashion retailing iii. Understanding fashion consumers and their buying behavior. iv. Consumer behavior and assessment theories	**15**

	v. Concept of decision making Self concept theory vi. Consumer analysis vii. Customer Response (CRS) viii. In-store shopping behavior: Situational factors, Shopper's intentions, stock situations (in-stock, stock-out, customer service), purchase decisions (current sales, potential sales, lost sales)	
	Supply chain management in fashion and textiles i. Concepts and principles of SCM: short interval scheduling (SIS), inventory carrying costs, supply chain for soft goods. What are supply chains, definitions ii. Information and technology in supply chain management: SCM enabling technologies: EDI, EPOS, item coding, EFT, activity based costing, etc. The applications of the information and technology for the SCM in the fashion industry. iii. Marketing sourcing and logistics decisions decisions iv. Pricing considerations: Competition, merchandise characteristics, International sourcing process: Research, Initial orders, L/C documents, follow-up, final quality inspection, Shipping documentation	**15**
UNIT IV	**Visual Merchandising** i. Environments of Visual presentations: Windows and interiors ii. Designing and fixturing for retail environment iii. Designing the interiors space iv. Trends in retail environment design **Entrepreneurship** i. Definition, Entrepreneurial skills ii. Realities, profiles of leading retail entrepreneurs iii. Starting your own business iv. Planning capital and environment influences. **Ecology, ethics and green issues** i. Business ethics and social responsibility, Ethics in retailing	15

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Course Code	Title	Periods/ week	Marks	Credits
PSHSIII203	**REGENERATED AND SYNTHETIC FIBRE SCIENCE**	**4**	**100**	**4**

Objectives :

1. To study the morphology, chemical constitution and manufacturing processes synthetic fibers.
2. To study physical and chemical properties and end uses of proteinic and synthetic fibers.
3. To acquaint students with recent developments in the field of fibers.

Course Content		Periods
Unit I	**Regenerated cellulosic fibers** a) Raw materials, manufacturing process, physical and chemical properties of regenerated fibers.(viscose rayon, cuprammonium rayon, polynosic fibers, high tenacity viscose, modal and lyocell) b) Chemically modified cellulose (primary and secondary acetate rayon)	**15**
Unit II	**Synthetic fibres** Synthesis of raw material, Manufacturing process, properties, uses and modification of various synthetic fibers a) Nylon 6, nylon 66 b) Polyester c) Acrylic	**15**
Unit III	**Other synthetic fibres** a) Modacrylic b) PVC, PVA, Elastomeric carbon, glass **Blends** currently used.	**15**
UnitIV	**Ecological concerns** in manufacturing and processing of regenerated and synthetic fibers. **Recent developments** in regenerated and synthetic fibers	**15**

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Course Code	Title	Periods/week	Marks	Credits
PSHSIII204	TECHNICAL TEXTILES	4	100	4

Objectives

1. To study about the various technical textiles, along with the essential properties of raw materials used in their manufacture and application.
2. To study the recent developments in technical textiles

Course Content		Periods
Unit I	**Medical Textiles** 1) Introduction to healthcare and medical textile devices. a. Polymers used in Medical applications (Alginate, Chitosan, Silk, PLA, PGA, Carboxymethyl cellulose, Cellulose acetate, Polyurethane, Polyester, Polypropylene etc) 2) Design criteria & fabrication of Medical textile products: with special focus on Knitting, Braiding, 3D weaving, nonwoven techniques, spacer fabric, composites, Hydrogel, Rapid prototyping, Electrospinning. 3) Interaction of cells on Polymeric textile structures (integrin recognition, cellular signaling process, gene expression, immune rejection, correlations with fabric structure and properties). 4) Broad general classification of Medical Textiles. 5) Non-implantable materials (existing products, limitations, future direction) . Wound-dressing, related hydrogel and composite products. . Bandages:Simple,Lightsupport, Compression, Orthopedic bandages. 6) Gauges. 7) Healthcare and Hygiene Products. Applications of hollow fibres for protein purification, drug delivery, biosensor. Implantable biomedical devices (existing products, limitations, future direction) 8) Vasculargrafts(knitting,nonwoven, electrospinning) 9) Sutures(mono/multifilament,braided) 10) Heartvalves(knitting) 11) Hernia mesh (knitted, nonwoven) 12) Extra-corporeal materials (existing products, limitations, future direction) 13) Cartilage (nonwoven, 3D weaving) 14) Skin(nonwoven,weaving) 15) Liver (rapid prototyping) 16) Kidney,Urinarybladder(nonwoven,3D weaving) 17) Tendons, Ligaments (Silk filaments, braiding) 18) Cornea(Electrospinning,hydrogel composite) 19) Soluble factor release (Drug, Growth factor Delivery), Enzyme (Matrix metalloprotease, proteases etc) attachment on fibrous materials. 20) Adhesive, anti-adhesive patches for Surgical application. 21) Phase change polymers & their healthcare applications. 22) Coating & finishing technologies for medical textiles. 23) Characterizing tests, Evaluation of commercial medical textiles products, International and National Standards. Fundamental aspects of safety training. Legal and ethical issues involved in the medical textiles materials. 24) Need, type and applications of 3D structure. 25) Methods of producing 3D structures through weaving and	15

	knobbing. 26) Warp and weft knitted spacer fabrics - production, properties and applications 27) Ku-knit and multi-knit 3D structures. Struto and wave maker techniques for producing 3D nonwoven Applications of 3D Nonwovens. 28) Production of 3D braided structures. 29) Type of composites and application areas of textile based composites. 30) Textile reinforcement materials in different types of composites. 31) One, two and three dimensional reinforcements and matrix materials for composites. 32) Production and properties of performs. 33) Production of rigid composites. 34) Properties and uses of rigid composites.	
Unit II	**Automotive Textiles** Application of textiles in automobiles. Requirements and design for pneumatic tyres Safety devices like air bags and Seatbelts in automobiles. Noise, vibration and heat insulation components in automobiles. Seating fabric characteristics for automobiles.	**15**
Unit III	**Sports Textiles** Sports clothing and Equipment-Scope and classification. Design of sports active wear. Design of sports active wear. Knitted structures in active sportswear. Waterproof breathable materials. Textile components of sports shoes. Sport surfaces and Equipment. **Textiles for Packaging** Textiles in food packaging. Fabrics for bags and luggage. Flexible Intermediate Bulk Packing.	**15**
Unit IV	**Textiles for Packaging** Textiles in food packaging. Fabrics for bags and luggage. Flexible Intermediate Bulk Packing.	**15**

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Tissue Engineering: Engineering Principles for the Design of Replacement Organs Tissues, by Mark Saltzman, Oxford University Press.
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Course Code	Title	Periods/week	Marks	Credits
PSHSIIIP201	ACCESSORY MAKING AND PRODUCT DEVELOPMENT	4	50	2

Objectives

1. To study about the accessories, along with the essential properties of raw materials used in their manufacture and application.
2. To study the recent developments in various accessories.

Course Content		Periods
Unit I	Head Gears, Stoles/scarfs & Belts- Traditional & Contemporary, brands, labels, designers Designing and making, value addition through colouration, embroidery, other techniques using different materials and methods	15
Unit II	Bags & Footwear- Traditional & Contemporary, brands, labels, designers Designing and making, value addition through colouration, embroidery, other techniques using different materials and methods	15
Unit III	Jewelry, Watches- Traditional & Contemporary, brands, labels, designers Designing and making, value addition through colouration, embroidery, other techniques using different materials and methods	15

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PATTERN MAKING, GRADING & GARMENT CONSTRUCTION- MEN'S WEAR

Course Code	Title	Periods/week	Marks	Credits
PSHSIIIP202	**PATTERN MAKING, GRADING & GARMENT CONSTRUCTION-MEN'SWEAR**	**4**	**50**	**2**

Objectives

1. To acquaint students to advance techniques of designing and pattern making for different styles of clothing for men.
2. To adapt constructed blocks to the given patterns and grading according to different sizes.
3. To familiarize students with special techniques of apparel making.
4. To acquaint students with the art of handling different materials and patterns.
5. Identification, analysis and selection of different types of fabrics for particular end-uses.
6. Layout of drafts on fabric and its cutting
7. Finishing and Packaging
8. Portfolio Presentation

Course Content		Periods
Unit I	1) Basic Block Construction (a) Adult's Basic Block, Sleeve, (b)Torso block (c) Drafting of yokes, gathers, pleats for upper and lower garments, collars (Shirt, Reversible, Shawl, Rever, Danton, Chinese) 2) Drafting of sleeves 3) Drafting and adapting patterns (along with draft instructions and markings) using anthropometric measurements and grading of upper block 4) Drafting and adapting patterns (along with draft instructions and markings) using anthropometric measurements and grading of lower block	**15**
Unit II	Upper Garments: Shirt Kurta/Sherwani, Partywear/Western Outfit- any two	**15**
Unit III	Lower Garments: Trouser, Chudidar, shrts/culottes- any two To include packets, zip attachment etc	**15**

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Course Code	Title	Periods/week	Marks	Credits
PSHSIIIP203	**VALUE ADDITION THROUGH DYEING AND PRINTING**	**4**	**100**	**2**

Objectives

1. To study about the dyes, pigments and chemicals used in textile colouration, along with the essential properties of raw materials used in their manufacture and application.
2. To study the recent developments in various dyeing and printing processes.

Course Content		Periods
Unit I	Introduction to and classification of dyes and pigments, Dyeing and Printing Auxiliaries	**15**
Unit II	Fashion effects through dyeing. Testing of the same Eco friendly materials and methods. Future trends in dyeing	**15**
Unit III	Fashion effects through printing- block, screen, digital etc. -single and mix methods. Testing of the same. Eco friendly materials and methods. Future trends in printing	**15**

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Course Code	Title	Periods/week	Marks	Credits
PSHSIIIP204	**FASHION PHOTOGRAPHY AND VISUAL MERCHANDIZING**	**4**	**50**	**2**

Objectives

1. To enhance the creative skills of photography.
2. To expose students to various methods of visual merchandizing
3. Portfolio

Course Content		Periods
Unit I	Various principles and methods of effective fashion photography for various marketing end uses- online and brick and mortar Demonstrations of photography and videography editing software's in computer applications	**15**
Unit II	Various principles and methods of effective videography for various marketing end uses- online and brick and mortar Demonstrations of photography and videography editing software's in computer applications	**15**
Unit III	Various principles and methods of effective visual merchandizing for various marketing end uses- online and brick and mortar. Demonstrations of photography and videography editing software's in computer applications	**15**

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M.Sc. (HOME SCIENCE) COURSES

Scheme of Examination

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part by conducting the Semester End Examinations with 60% marks in the second part. Students are required to pass separately in the Internal Assessment and Semester End with a minimum of 40% marks in each component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

Internal assessment for Theory 40 %

Sr. No	Evaluation type	Marks
1	One seminar based on curriculum assessed by teacher of the institution teaching PG learners / Publication of a research paper/ presentation of a research paper in seminar or conference. A. Selection of the topic, introduction, write up, references- 15 marks. B. Presentation with the use of ICT- 15 marks.	30
2	Active participation in routine class instructional deliveries	05
3	Overall conduct as a responsible learner, communication and leadership qualities in organizing related academic activities	05

Semester End Theory Examination 60 %
Theory Question Paper Pattern

External examination of 60 marks (three unit courses)
Duration: These examinations shall be of two and half hours duration.
Theory question paper pattern:

(for 3 units)

- There shall be four questions each of 15 marks. On each unit there will be one question and the fourth question will be based on the entire syllabus (all Units).
- All questions shall be compulsory with internal choice within the questions.
- Questions may be subdivided into sub-questions a, b, c… and the allocation of marks depend on the weightage of the topic.

(for 4 units)

- There shall be five questions each of 12 marks. On each unit there will be one question and the fifth question will be based on the entire syllabus (all Units).
- All questions shall be compulsory with internal choice within the questions.
- Questions may be subdivided into sub-questions a, b, c… and the allocation of marks depend on the weightage of the topic.

Practicals

Sr. No	Evaluation type	Marks
1	Laboratory work: **Semester End Examination**	40
2	Journal	05
3	Viva	05
		50

Duration: Conduct of practical examinations shall be of three hours duration.

Note : Courses with Planning as a component of the practical examination will conduct a Planning of two hours in addition to the practical examination of 3 hours.

UNIVERSITY OF MUMBAI

No.UG/ICC/2016-17/03
MUMBAI- 400 032
21st April, 2016

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

Madam,

I am to invited your attention to Ordinances, Regulations and Syllabi relating to the Master of Science (M.Sc.) (Home Science) degree program **vide** this office Circular No. UG/129 of 2015, dated 10th December, 2015 and to inform you that the recommendation made by the Faculty of Science at its meeting held on 9th March, 2015 has been accepted by the Academic Council at its meeting held on 11th March, 2015 **vide** item No.4.18 and that in accordance therewith, the revised syllabus M.Sc. Home Science in i) Food Nutrition & Dietetics, ii) Food Processing & Preservation, iii) Sports Nutrition, iv) Human Development & v) Textile & Fashion Technology, which is available on the University's web site (www.mu.ac.in) and that the same has been brought into force with effect from the academic year 2016-17.

Yours faithfully,

Deputy Registrar
Under Graduate Studies

A.C/4.18/11/03/2016

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