



पाठ्यक्रम SYLLABUS

SCHEME OF EXAMINATION AND COURSES OF STUDY

FACULTY OF SCIENCE

M.Sc. FOOD & NUTRITION

M.Sc. (Previous (Semester I & II), M.Sc. Final (Semester III & IV))

2009-10 से प्रभावी(w.e.f.)

सत्र 2013-14

महर्षि दयानन्द सरस्वती विश्वविद्यालय, अजमेर

M.Sc. Examination (Semester Examination Scheme)

Reg. 17

1. There shall be 16 papers (Four papers in each semester consisting of four semester). Each theory paper shall be of three hours duration having 50 marks. Out of 50 marks 20% marks viz. 10 marks shall be of internal assessment based on test, seminars and project work in each paper. Dissertation based on project work, prescribed if any, in lieu of fourth semester shall be of 300 marks out of which 150 marks shall be of project work and 150 marks shall be of project presentation and viva-voce.

2. The maximum marks for each paper/practical shall be shown in the syllabus for the subject concerned. It will be necessary for the candidate to pass in the theory part as well as in the practical parts (Wherever prescribed) of a subject/paper separately.

3. A Candidate for a pass of each of the semester shall be required to obtain (i) at least 36% marks in the aggregate of all the papers prescribed for the examination and (ii) at least 36% marks in the practical (s)/dissertation wherever prescribed at the examination, provided that if a candidate fails to secure at least 25% marks in each individual paper at the examination and 36% marks in dissertation/ Project work, wherever prescribed in fourth semester in lieu of four papers, he shall be deemed to have failed at the examination, notwithstanding his having obtained the minimum percentage of marks required in the aggregate for the examination. No division will be awarded at the first, second and third semester examinations. Division shall be awarded at the end for the fourth semester examination on the combined marks obtained at the first, second, third and fourth semester examination taken together as noted below

Passed with First Division	60% of the aggregate marks taken together of first, second, third and fourth semester examinations
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Passed with second division	48%
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All the rest will be declared to have passed the examination

4. ATKT / due papers shall be applicable in 50% of the total subjects in the semester. Due papers/practical or both of first semester will be held along with third semester similarly, due papers/practical or both of second semester will be held along with fourth semester. The third and fourth semester due papers/practical or both will be held in the first and second semester respectively of the next year. If candidate again failed may appear in respective semester examination of subsequent year (s).

5. If a candidate clears any paper (s)/Practical/ Dissertation prescribed at the semester examination after a continuous period of three years, then for the purpose of working out the division the minimum pass marks only viz. 25 % (36% in case of practical/ dissertation) shall be taken in to account in respect of such paper(S)/practical (s) /dissertations are cleared after the expiry of the aforesaid period of three years provided that in case where a candidate requires more than 25% marks in order to reach the minimum aggregate as many marks out of those actually secured by him will be taken into account as would enable him to make up the deficiency in the requisite minimum aggregate.

6. The grace marks shall be given up to 1 % of the total aggregate marks of

NOTICE

1. Change in Statutes/Ordinances/Rules/Regulations/ Syllabus and Books may, from time to time, be made by amendment or remaking, and a candidate shall, except in so far as the University determines otherwise comply with any change that applies to years he has not completed at the time of change. The decision taken by the Academic Council shall be final.

सूचना

1. समय-समय पर संशोधन या पुनः निर्माण कर परिनियमों /अध्यादेशों / नियमों / विनियमों / पाठ्यक्रमों व पुस्तकों में परिवर्तन किया जा सकता है, तथा किसी भी परिवर्तन को छात्र को मानना होगा बशर्ते कि विश्वविद्यालय ने अन्यथा प्रकार से उनको छूट न दी हो और छात्र ने उस परिवर्तन के पूर्व वर्ष पाठ्यक्रम को पूरा न किया हो। विद्या परिषद द्वारा लिये गये निर्णय अन्तिम होंगे।

theory of that semester in maximum one paper.

7. The dissertation/ Project report, wherever prescribed, shall be type written and submitted in triplicate to the Principal of the college concerned or Head of the Department concerned as the case may be at least 7 days before commencement of the theory examination. The Principal / Head of the department concerned must ensure that the dissertation / Project work so submitted reach to the office of the Registrar within a week's time. Evaluation of the dissertation / Project work shall be conducted centralized.

For details of papers, maximum and minimum marks and syllabus etc. see separate booklet of syllabus.

M.Sc. Foods and Nutrition

Eligibility

The candidates for admission to the M.Sc. Foods and Nutrition programme should have secured 50% marks at degree level in B.Sc. Home Science (Pass/Honours in Foods & Nutrition) or B.Sc. in Foods & Nutrition or B.Sc. with Clinical Nutrition and Dietetics and Chemistry with any other Science subject or B.Sc. with diploma in Dietetics.

RESERVATION

Reservation of Seats/Relaxation of marks for SC, ST, OBC, Physically Handicapped, Displaced Kashmiri Candidates and University, Employee, employee's spouse/son or daughter.

- A) 49 percent of the total number of seats in each course in the Faculties of social Science, Science, Commerce (including Certificate/Diploma course, if any, in all these Faculties) will be reserved in each department for natural born sons/daughters of parents belonging to Scheduled Castes (16 percent), Scheduled Tribes (12) and other Backward Classes (21 percent) excluding those who fall within category of creamy layer
- B) Three percent of the total number of seats in each course in the faculties specified in (a) above will be reserved in each department for Physically Handicapped candidates (enclose certificate as per note ii) and one percent for displaced Kashmiri candidates in all the categories.
- C) Super numeral seats in each course run by the university teaching departments shall be reserved for the University Employees (teacher, officer and non teaching staff), employee's spouse/son or daughter. The additional seats for University, employee, employee's spouse/son or daughter will be in addition to the total number of seats allotted in that particular course. The admission under this reserved category will be made on the basis of combined merit of applications under this category. One additional seat will be reserved for the University wards having 20 seats per course. In case of 40 seats, 2 seats will be reserved for the University employees/wards. This reservation would also be applicable for admission to those courses where university entrance examination is conducted. However, the reservation would not be applicable for admission to those courses where state level entrance test examination is conducted. Preference will be given to non-income tax payers.
- D) All Scheduled Caste, Scheduled Tribes, OBC, PH and displaced Kashmiri candidates who have passed the qualifying examination for admission to

a University, to M.A./M.Sc./M.Com./Diploma/Certificate course may be arranged in the order of merit among themselves.

- E) Special relaxation for wards of Kashmiri migrants as per the MHRD Secondary and higher Education department of GOI letter no. F 10-1/2006(U) dated 8/3/2006
 1. Extension in the date of admission by about 30 days
 2. Relaxation in cutoff percentage up to 10% subject to minimum eligibility requirement.
 3. Increase in intake capacity up to 5% course wise
 4. Reservation of at least 1 seat in merit quota in technical/professional institutions.
 5. Waiving of domicile requirement.
 6. Felicitation of migration in second and subsequent years.
- F) For SC/ST/OBC candidates:-
 - i. Those who have secured marks above the level up to which general category students are admitted, should not be counted towards reserved quota at all and should be included in the general merit list of admissions.
 - ii. Excluding those admitted on merit along with general Candidates as at (i) above, other Scheduled Caste and Scheduled Tribe and OBC candidates should be admitted in the order of merit going down the inter-se-merit list up to the point necessary to secure adequate number of candidates of scheduled Castes as well as Scheduled Tribes to fulfill the reservation percentage completely.
 - iii. It is clarified that in order to fill the reservation quota, there should be no hesitation to go down, if necessary, to the pass percentage of the qualifying examination (i.e. B.A./B.Sc./B.Com. pass course as well as Honors degree for admission to a post-Graduation.
 - iv. In case of non-availability of SC candidate(s) the reserve seat(s) for SC shall be filled in by ST candidates, if available. Similarly, in case of nonavailability of ST Candidate(s), the reserve seat(s) of ST shall be filled in by SC candidates, if available. Left over SC/ST/OBC reserved seats could be filled in by general category of the candidates by concerned head of Department in case of non-availability of SC/ST/OBC candidates after taking permission from Hon'ble Vice-chancellor

PROGRAMME OF STUDY: - The post graduate programme (M.Sc. Foods & Nutrition) will be of two years duration with exams conducted according to the University Semester Scheme. The 2 years course will be divided into 4 Semesters, of 6 months duration each.

SCHEME

The scheme of examination with nomenclature of papers (Theory and Practical) for every semester, with marks and hours of instruction, are clearly mentioned in the syllabus. The minimum pass marks in individual papers for any semester will be 36% and the aggregate pass marks for the semester will be 36%.

INTERNAL ASSESSMENT

For every theory and practical paper 20% of the maximum marks will be awarded on the basis of internal assessment. Internal assessment will be based on :

- a) Written tests (minimum two)-10%
- b) Assignments/class presentations/group discussions/regularity in the class

room-10%

EXAMINATION

a) Result: - The minimum pass marks in individual papers for any semester will be 36% and the aggregate pass marks for the semester will be 36%.

b) Division: -First division is awarded to candidates securing 60% marks in the aggregate or above, Second division is awarded to candidates securing 48% to 59.9% marks. Candidates securing less than 48% marks will be awarded Third Division and below 36% marks in the aggregate will be declared as failed.

C) Due Paper: - Candidates securing less than 36% marks in two papers in a single semester can reappear in that paper when the next exam of the Semester Scheme is held.

M. Sc. Foods and Nutrition**Programme of Study and Examination Scheme**

Semester-wise distribution of courses:

Semester	Paper No.	Nomenclature of Paper	Marks		Hours of Instructions	
			Theory	Practical	Theory	Practical
I	I	Human Physiology	50		4	
	II	Food Microbiology	50	50	4	4
	III	Advanced Nutritional Biochemistry-I	50	50	8	8
	IV	Statistics and Computer Application	50		4	4
		Semester Total	200	100	20	16
			300		36	
II	V	Research Methodology	50		4	2
	VI	Advanced Nutritional Biochemistry - II	50	50	6	6
	VII	Advanced Nutrition - I	50	50	6	6
	VIII	Problems in Human Nutrition	50		4	
		Semester Total	200	100	20	16
			300		36	
III	IX	Advanced Nutrition-II	50		4	
	X	Nutrition for Vulnerable Groups	50		4	2
	XI	Food Science	50	50	6	6
	XII	Public Nutrition	50	50	6	4
		Dissertation				4
		Semester Total	200	100	20	16
			300		36	
IV	XIII	Clinical & Therapeutic Nutrition	50	50	6	4
	XIV	Institutional Food Administration	50	50	6	5
	XX	Dissertation	100			15
		Semester Total	200	100	12	24
			300		36	
GRAND TOTAL			1200			

SEMESTER I**PAPER I****HUMAN PHYSIOLOGY**

Hours of Instruction/Week: 4

Duration of Examination: 3 hrs

Max Marks: 50

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives:

This course will enable students to:

1. Advance their understanding of some of the relevant issues and topics of human physiology.
2. Enable the students to understand the integrated function of all systems and the grounding of nutritional science in physiology.
3. Understand alterations of structure and function in various organs and systems in disease conditions.

Contents:**UNIT I**

1. **Cell structure and functions** - levels of cellular organizations and functions- organelles, nucleus, cytoplasm, tissues, organs and systems- brief review. Functions of lysosomes, endoplasmic reticulum, Golgi apparatus and mitochondria. Mitosis, Regulation of cell multiplication.

2. **Structure of cell membrane**, active & passive transport of nutrients and metabolites, intercellular communications.

3. **Nervous System**: review of structure and function of neuron, conduction of nerve impulse, synapses, the resting potential, the action potential and its characteristics. Mechanism of synaptic transmission. Reflex action. Role of neurotransmitters. Organization of the Central Nervous System, structure and function of brain and spinal cord, afferent and efferent nerves, Blood Brain Barrier, CSF. Hypothalamus and its role in various body functions- obesity, sleep, and memory.

4. **Endocrine System**: Endocrine glands- structure, function, chemistry,

storage, secretion, regulation of hormonal secretion. Mechanism of action of hormones. The neuroendocrine axis. Emphasis on physiology of diabetes and stress hormones. Physiological functions and abnormalities in secretion of pituitary, thyroid, parathyroid hormones, adrenal and reproductive hormones. Disorders of endocrine glands.

5. Reproduction System: menstrual cycle, spermatogenesis, physiological changes in pregnancy.

UNIT II

6. Digestive System: Review of structure and function of various organs of gastrointestinal tract. Secretory, Digestive and Absorptive functions. Role of liver, pancreas, gall bladder and their dysfunction. Motility and hormones of the GIT.

7. Respiratory Systems: Review of structures and functions. Mechanism of Respiration Pulmonary ventilation. Role of lungs in the exchange of gases. Transport of O_2 and CO_2 in the lungs, blood and tissues. Role of hemoglobin and buffer systems. Cardio-respiratory response to exercise and physiological effects of training. Regulation of respiration. Aviation, high altitude and space physiology.

8. The Circulatory System: Structure and function of the heart and blood vessels. Regulation of cardiac output, cardiac cycle, blood pressure and factors affecting it, heart failure, hypertension.

9. Blood : functions of blood, composition of blood, blood cells, normal constituents of blood, plasma and serum. Formation and functions of hemoglobin, erythropoiesis, factors affecting haematopoiesis, destruction of erythrocytes and Anemia. Leucocytes- genesis and functions. Regulation of pH of blood and body fluids. Blood groups and histocompatibility. Blood indices. Use of blood for investigation and diagnosis of specific disorders. Blood coagulation- mechanism, conditions causing excessive bleeding, anticoagulants.

UNIT III

10. Excretory System: Anatomy and physiology of kidneys. Structure and function of nephron. Urine formation. Normal and abnormal constituents of urine. Role of kidney in maintaining pH of blood, water, electrolytes, acid-base balance. Diuretics.

11. Sense Organs: Review of structures and function. Role of skin, eye, ear, nose and tongue in perception of stimuli. Physiology of vision, hearing, taste and smell.

12. Regulation of body temperature- thermo genesis, thermolysis, pyrexia, hypothermia.

13. Musculo-Skeletal System - structure and function of bone, cartilage and connective tissue. Disorders of the skeletal system. Types of muscles, structure and function.

14. Immune System: Structure and functions of thymus and spleen. Cell mediated and humoral immunity. Activation of WBC and production of antibodies. Role of inflammation and defense. Allergy and hypersensitivity.

References:

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2. Moran Campell E.J, Dickinson C.J, Slater J.D, Edwards C.R.W and Sikora (1984): Clinical Physiology 5th edition ELBS Blackwell Scientific Publications.
3. Guyton A.C(1985): Functions of the Human Body 4th edition W.B. Saunders Company Philadelphia.
4. Guyton A.C and Hall J.B(1996): Textbook of Medical Physiology 9th edition W.B. Saunders Company, Prime Books(Pvt) Ltd. Bangalore.
5. Wilson K.J.W and Waugh.A(1996): Ross and Wilson Anatomy and Physiology in Health and Illness 8th edition Churchill Livingstone.
6. Chatterjee C.C.(1992): Human Physiology Vol I and II 11th edition Medical Allied Agency, Calcutta.
7. Kale C.A. and Neil F Samean (1974): Wright's Applied Physiology.
8. Griffith's M (1974): Introduction to Human Physiology MacMillan and Co.
9. Green J.N(1972): An Introduction to Human Physiology.
10. McArdle W.D, Katch F.I and Katch V.L(1996): Exercise Physiology, Energy Nutrition and Human Performance 4th edition Williams and Wilkins, Baltimore.
11. Jain A.K. Text book of Physiology Vol I and ii Avichal Publishing Co New Delhi.

PAPER II

FOOD MICROBIOLOGY

Hours of Instruction/Week: 4
Duration of Examination: 3 hrs

Max Marks:50
Main Examination : 40
Continuous Assessment : 10
Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives:

To enable the students to-

1. Gain deeper knowledge of the role of microorganisms in humans and

environment.

2. Understand the importance of microorganisms in food spoilage and to learn advanced techniques used in food preservation.
3. Understand the latest procedures adopted in various food operations to prevent food borne disorders and legal aspects involved in these areas.

Contents:

UNIT I

1. Microorganisms of importance in food- role of bacteria and fungi, sources, taxonomy, morphology, cultural and physiological characteristics and biochemical activities.
2. Factors Affecting Growth of Microorganisms- intrinsic and extrinsic factors like pH, water activity, oxidation reduction potential, nutritional requirements, temperature, relative humidity, gaseous environment, biological structure of food and inhibitory substances.
3. Methods of Isolation and Detection of Microorganisms or their products in food
 - (a) Conventional methods
 - (b) Rapid methods (newer techniques)
 - (c) Immunological methods- fluorescent, antibody, radio Immune assay, ELISA etc
 - (d) Chemical methods- Thermo stable, nuclear, ATP measurement and PCR(Polymer chain reactions)- only principles in brief.
 - (e) Microbiological Assays.
4. Sources of contamination of food- Water, air, soil, sewage, animals, during handling and processing.

UNIT II

5. General principles underlying spoilage.
 - (a) Chemical changes due to microbial spoilage.
 - (b) Spoilage of different groups of foods- cereal and cereal products, vegetables and fruits, meat and meat products, egg and poultry, fish and other sea foods, sugar, milk and milk products, canned food.
6. Role of microbes in fermented foods and genetically modified foods oriented fermented foods, malt, bread, beverages, vinegar fermented vegetables, fermented dairy products, tea and coffee. Single cell protein, fats, amino acids and enzymes from microorganisms.
7. Food Preservation- physical methods- drying, freeze drying, cold storage, heat treatment, irradiation, high pressure processing. Chemical preservatives and natural antimicrobial compounds. Biologically based preservation systems and probiotic bacteria.
8. Food Borne Diseases- infections and intoxications. Bacterial and viral food borne disorders. Food borne important animal parasites. Mycotoxins

UNIT III

9. Food Sanitation- microbiology in food plant sanitation, bacteriology of water, sewage and waste treatment and disposal. Microbiology of the food product.

10. Indicators of food safety and quality- microbiological criteria of foods and their significance.
11. HACCP system and food safety- Introduction, need, benefits, & principles of HACCP.
 - Guidelines for application of HACCP principles.
 - The HACCP system in India
12. Food control and enforcement agencies- Food standards and regulation in India.
 - Regulations related to genetically modified foods.
 - International organizations and agreement in the area of food standard and quality control.

**PAPER II
FOOD MICROBIOLOGY
PRACTICAL**

Hours of Instruction/week: 4

Max Marks: 50
Min. Pass Marks-18

Contents:

1. Microbiological apparatus and equipments- a basic introduction, instruments needed for isolation, cultivation and maintenance of microbes, tools needed in microbiology laboratory for inoculation and culturing
2. Cleaning and sterilization procedures for glassware.
3. Preparation and sterilization of laboratory media.
4. Staining of bacteria- gram's staining, use of oil immersion lens, micrometry, and microscopic enumeration.
5. Spread plating, pour plating, streaking techniques.
6. Enrichment of isolated cultures, SPC, MPC. Coli count and coli confirmations.
7. Study of biochemical characteristics of isolated cultures-
 - Fermentation reaction · Starch cultures
 - IMVIC Tests · Catalase test
 - Oxidase test · Urease test
 - H₂S test · Coagulase test
8. Microbiological analysis of milk- raw, boiled and pasteurized - MBRT Test.
9. Demonstration of Techniques of
 - Radio immune Assay (RIA)
 - Enzyme Linked Immuno Sorbent Assay (ELISA)

References:

1. Releazar, M.I and Reid, R.D.(1993): Microbiology, Mc Graw Hill Book Company New York 5th edition.
2. Atlas, M. Ronald (1995): Principles of microbiology 1st edition, Mosby Year Book, Inc, Missouri, USA.
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5. Frazier, W.C. (1988) Food Microbiology Mc Graw Hill Inc 4th Edition.
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7. Banwart, G. (1989) Basic Food Microbiology 2nd Edition CBS Publisher.
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10. Adams, M.R. and M.G. Moss (1995): Food Microbiology 1st Edition New Age International (P) Ltd.
11. Benason, H.J. (1990) Microbiological applications C. Brown Publishers USA
12. Roday, S. (1999) Food hygiene and sanitation 1st Edition Tata Mc Graw Hill, New Delhi.
13. Venderzant, C. and D.F. Splitls Toesser (1992): Compendium of Methods for Microbiological Examinations of Foods 3rd Edition American Public Health Association, Washington, D.C.

PAPER III**ADVANCED NUTRITIONAL BIOCHEMISTRY I**

Hours of Instruction/Week: 8

Duration of Examination: 3 hrs

Max Marks: 50

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives:

To enable the students to-

1. Understand the biochemical basis for nutrition and health
2. Understand the mechanisms adopted by the human body for regulation of metabolic pathways.
3. Get an insight into interrelationships between various metabolic pathways.
4. Become proficient for specialization in nutrition.
5. Understand integration of cellular level metabolic events to nutritional

disorders and imbalances.

Contents:**UNIT I**

1. **Electrolytic Dissociation** – Acids, bases, salts, buffers, Hendersen-Hasselbach equation. Theory of indicators and principles of measurement of pH.
 2. **Basics of Instrumentation** – Physio-chemical principles and methodology – Weighing, Centrifugation, Colorimetry, photometry, fluorimetry, flame photometry and atomic absorptiometry.
 3. **Chromatography** – principles and application in paper (circular, ascending and descending), ion-exchange, column, thin layer, gas liquid and high performance liquid chromatographic techniques.
 4. **Electrophoresis** – Principle and applications in paper and gel electrophoresis.
 5. **Carbohydrates**- mono, di and polysaccharides. Isomerism. Homo and hetero polysaccharides. Mucopolysaccharides, lipopolysaccharides. Glycoprotein, proteoglycans.
- Important chemical reactions of monosaccharide. Proof of ring structure

UNIT II

6. **Lipids**- Classification and chemistry of lipids and fatty acids, chemical properties of lipids- hydrolysis, saponification, hydrogenation, esterification, halogenations and acetylation. Characteristics of fats. Saponification number, acid number, Reichert-Meissel number, UV absorption. Rancidity of fats & oils. Phospholipids and steroids.
7. **Proteins**- amino acids-classification and structure, reactions, methods of separation of amino acids-chromatography, micro-biological, electrophoretic methods. Structure of Proteins, Peptide bonds. Denaturation of proteins. Plasma proteins- nature, properties, functions. Structures of Insulin, Myoglobin and Hemoglobin.
8. **Enzymes**- classification, general properties, catalysis, Coenzymes, specificity, isolation and purification, intracellular distribution of enzymes, allosteric enzymes, Isoenzymes. Kinetics- effect of time, temperature, pH on velocity of enzyme catalyzed reactions, inhibition of enzymes, and importance in clinical diagnosis.
9. **Biological Oxidation**- concept of free energy, redox potential, oxidoreductases, oxidases, dehydrogenases, hydroperoxidases and oxygenases. Oxidative phosphorylation and mitochondrial transport system.

UNIT III**10. Intermediary Metabolism:**

- (a) Overview of intermediary metabolism. Citric Acid Cycle
11. **Carbohydrate Metabolism:** Glycolysis, Glycogenolysis, Glycogenesis, Gluconeogenesis, Hexose monophosphate shunt.

13. Lipid Metabolism: beta oxidation of odd and even numbered saturated fatty acids, biosynthesis of fatty acids, mitochondrial and extra mitochondrial system for denovo synthesis, microsomal system for chain elongation. Biosynthesis of cholesterol, formation and metabolism of Ketone bodies. Ketosis. Biosynthesis of triacyl glycerol and phospholipids, mono acyl glycerol pathway. Essential fatty acids.
14. Protein Metabolism: Urea cycle, creatine and creatinine synthesis, deamination of amino acids, metabolism of non protein amino acids. Biologically active peptides and polypeptides.
15. Interrelationship between carbohydrate and lipid metabolism at organ level, enzymatic level, hormonal level and regulatory level.

PAPER III**ADVANCED NUTRITIONAL BIOCHEMISTRY I****PRACTICAL**

Hours of instruction/week: 8

Max. Marks: 50

Min. Pass Marks-18

Objectives:

This course will enable the students to:

1. Understand the principles of biochemical methods used for the analysis of food and biological samples.
2. Perform biochemical analysis with accuracy and reproducibility.

Contents:

1. Safe and systematic working in the laboratory. Concept of accuracy and concentration. Preparation of routine and standard laboratory reagents. Determination of strength of acids and alkali solution.
2. Principle, working use, care and maintenance of various instruments used in laboratory investigations-ph meter, cyclomixer, water bath, spectrophotometer, colorimeter, dessicator, centrifuge, oven.
3. Preparation of buffers and determination of their pH by use of laboratory indicators and pH meters.
4. (a) Collection and storage of biological specimens – blood, urine, faeces etc.
(b) Preparation of sub cellular fractions using differential centrifugation techniques.
5. Hematological Estimation
(a) Hemoglobin, packed cell volume, red blood cell count, calculation of certain hematological Indices MCV, MCHC, MCH.
(b) Total Leucocytes count, Differential Leukocytes count, Erythrocytes sedimentation rate, bleeding time and clotting time.
(c) Determination of serum iron total iron binding capacity and transferrin saturation.
6. (a) Estimation of serum proteins, Serum total protein, albumin, globulin and Albumin, Globulin ratio.

- (b) Estimation of blood urea.
7. Estimation of blood glucose and lipid profile.
(a) Blood glucose
(b) Serum total cholesterol
(c) Serum triglyceride fractions
(d) LDL-Cholesterol HDL-Cholesterol fractions
(e) Total phospholipids concentration.
8. Assay of serum enzymes-Alkaline phosphatase, Amylase, Transaminase-SGOT, SGPT, Alanine-Aspartate Transaminase.

PAPER IV**STATISTICS AND COMPUTER APPLICATIONS**

Hours of Instruction/Week: 4

Max Marks:50

Duration of Examination: 3 hrs

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit **All questions are compulsory**. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. **All questions are compulsory** The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any **three** questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives: To enable students

1. To understand the role of statistics and computer applications in research.
2. To apply statistical techniques to research data for analyzing and interpreting data meaningfully.

Contents:**UNIT I**

1. Meaning and scope of Statistics, Role of Statistics in research, limitations of Statistics.
2. **Conceptual understanding of statistical measures.** Classification and tabulation of data. Measurement of central tendency, measures of variation.
3. **Frequency distribution, histogram, frequency, polygons, Ogive.**
4. **Binomial distribution**
5. **Normal distribution-Use of normal probability tables.**

UNIT II

6. Parametric and non-parametric tests.
7. Testing of hypothesis. Type I and Type II errors. Levels of significance.
8. Chi-square test. Goodness of fit. Independence of attributes 2 X 2 and r X c contingency tables.
9. Application of student's 't' test for small samples. Difference in proportion for means and difference in means.

UNIT III

10. Correlation, coefficient of correlation, rank correlation
11. Regression and prediction
12. Analysis of variance- one way and two-way classification.
13. Experimental designs
 - (a) completely randomized design
 - (b) randomized block design
 - (c) Latin square design
 - (d) Factorial design
 - (e) Trend analysis
14. The Computer: its role in research, computer fundamentals, Introduction to personal computers. Word processing. Use of computers in data processing, analysis and presentations.

PAPER IV**STATISTICS AND COMPUTER APPLICATIONS****PRACTICAL**

Hours of Instruction/week: 4

(Internal Assessment)

Objectives:

The student:

1. Knows basics of computer.
2. Applies computer basics in research.

Contents:**1. Introduction to Computers**

Fundamental terms, Parts of a computer and its processing.

2. Important Window Components**3. Microsoft office**

- (i) Word processing - Introduction, Typing, Formatting and tables.
- (ii) Power point - Introduction, preparing slides, inserting objects in presentation, setting up and running slide show on screen.
- (iii) Excel - Introduction, Entering data, Formulas, Editing worksheet data, Graphics and charts.

4. Introduction to Internet.**5. Computer maintenance.****6. Computer application in Foods and Nutrition.****References:**

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8. Daniel WW.: Biostatistics: A found action for analysis in the Health Sciences (3rd Ed.) John Wiley and sons.
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SEMESTER II**PAPER V****RESEARCH METHODOLOGY**

Hours of Instruction/Week: 4

Max Marks: 50

Duration of Examination: 3 hrs

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit. All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four

hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives: To enable students-

1. To understand the significance of statistics and research methodology in Home Science research.
2. To understand the types, tools and methods of research and develop the ability to construct data gathering instruments appropriate to the research design.
3. To understand and apply the appropriate statistical technique for the measurement/scale and design.

Contents:

UNIT I

1. **Basic concept-Science, research and scientific methods, scientific approach.**
2. **Role of statistics and research in Home Science discipline.** Objectives of research
3. (a) An overview of the research process. Criteria of good research. Common problems encountered during research studies. Qualities of a good researcher.
- (b) **Types of Research:** Historical, epidemiological, descriptive & case study, correlation, cross-sectional, analytical-experimental, observational, case control, cohort, and participatory research.
4. **Definition and Identification of a Research problem**
 - Selection of research problem
 - Justification
 - Theory, hypothesis, basic assumptions, limitations and delimitations of the problem.
5. **Variables:** Types of Variables- Independent and dependent variables, Qualitative and Quantitative- discrete and continuous. Error producing variables- intervening, extraneous and attribute variables, methods of controlling variables, Statistical manipulation of variables. Physical manipulation of variables, a selective manipulation of variables.
6. **Sampling designs & techniques**
 - Population and sample
 - Probability sampling: simple random, systematic random sampling, two stages and multi stage sampling, cluster sampling.
 - Non-Probability sampling: purposive, quota and volunteer sampling/ snow-ball sampling.

UNIT II

7. **Research Design**
 - Meaning & Purposes of research design
 - Features and importance of research design
 - Different research designs
8. (a) **Qualitative Research Methods:**

- Theory and design in quantitative research
 - Definition and types of qualitative research.
 - Methods and techniques of data collection
 - (i) Group discussions
 - (ii) Interviews: Key informants, in-depth interviews
 - (iii) Observations (iv) Social mapping
 - (v) Participatory rapid assessment (vi) Participatory learning assessment
 - (vii) Case Study
- Data Gathering Instruments: Observation, Schedule, questionnaire, interview schedule, scaling methods, case study. Reliability and validity of measuring instruments.

UNIT III

9. Quantitative research:

- (i) **Design strategies in Research- Descriptive Studies.** Brief overview of types of descriptive studies
 - Correlational studies (Populations/individuals)
 - Case reports and case studies
 - Cross sectional surveys

Use of descriptive studies in research. Hypothesis formulation from descriptive studies. Issues in the design and conduct of descriptive studies.
- (ii) **Design strategies in Research- Analytic Studies I**
 - Observational studies
 - Case-control studies
 - Cohort studies- retrospective and prospective
 - Intervention trials

Use of Analytic studies. Issues in the design and conduct of case control studies, definition and selection of cases, selection of control, Issues in Analysis and interpretation of case studies.
- (iii) **Design strategies in Research- Analytic Studies II**
 - Overview of types of Cohort studies and Intervention Studies.
 - Issues in the design of Cohort studies (selection of the exposed population, selection of comparison groups, sources of data, sources of exposure information, sources of outcome data)
 - Issues in analysis and interpretation of cohort studies (role of bias, effect of loss to follow up effect of non-participation).
 - Strengths and limitations of intervention studies.
 - Unique problems of intervention studies.
 - Issues in analysis and interpretation of clinical and community trials.
10. **Measurement and the appropriate statistical techniques-** Scales-types, sources of error, tests, measurement tools.
11. **Selecting a problem and writing a research proposal-**
 - Selection of problem area, topic and defining the problem.

- Literature search – reviewing related literature, referencing, abstracting, computer searches, bibliography.
- Developing the research proposal- Title, statement of the problem and its scope, defining concepts, objectives, basic assumption, delimitations and limitations of the problems.
- Statement of hypothesis
- Data collection procedures- Designing study, treatment of data.

UNIT III

12. Ethics in research

- (a) Data processing and analysis. Categorization, editing, coding, tabulation and statistical testing.
- (b) Presentation of data- General guidelines for presenting data. Use of tables, graphs, diagrams, in presentations. Types and characteristics of good tables, diagrams, graphs and other illustrations.
- (c) Interpretation of findings.

13. Scientific writing as a means of communication.

- Different forms of scientific writing
- Articles in journals, Research notes and reports, Review articles, Monographs, Dissertations, Bibliographies.

14. Analysis/Presentation and reporting of data.

- Drafting Titles, Sub Titles, Tables, Illustrations.
- Tables as systematic means of presenting data in rows and columns and lucid way of indicating relationships and results.
- Formatting Tables: Title, Body tab, Tab Column, Column head, Spanner Head, Box head.

15. Writing dissertation/Research report/ Article

The writing process

- Getting started
- Use outline as a starting device
- Drafting
- Reflecting, Re-reading - Checking organization, headings, content, clarity and grammar.
- Brevity and precision in writing
- Drafting and Re-drafting based on critical evaluation
- (a) Preliminaries – title page, acknowledgement index, list of tables, list of figures, plates, photographs etc.
- b) (i) Text, footnotes, quotations
- (ii) Spacing, margins, pagination, indentations.
- c) Writing
- (i) Introduction, Scope, Objective, hypothesis.
- (ii) Review of related literature
- (iii) Methodology
- (iv) Results and Discussions
- (v) Summary, conclusions and recommendations

(vi) Bibliography

(vii) Appendices: Use and guidelines

(viii) Abstract

Checking content, continuity, clarity, validity, internal consistency and objectivity during writing each of the above parts.

16. Critical analysis of research

PAPER V

RESEARCH METHODOLOGY

PRACTICAL

(Internal Assessment)

1. Annotation of Research articles. Critical analysis of the article.
2. Study and critical analysis of post graduate level thesis.
3. Study and report highlights of Review Articles.
4. Construction of various tools for research purposes..
5. Preparation of a Research proposal for M Sc. Dissertation.
6. Reporting related Literature on a given topic.
7. Writing the Bibliography and citing references taken from various sources e Books, Journals, Internet, Thesis etc.
8. Data collection related to Nutritional problems using various techniques.
9. Presenting the given Data in the form of Tables, Charts, Graphs etc. and its interpretation.
10. Preparing Check lists for evaluation of a given Research Report , Research Paper and Dissertation.
- 11 Seminar (On Current Trends and issues in Foods and Nutrition) Any topic of interest may be chosen by the teaching faculty to include current issues, pertinent problems, changing trends in the areas, and assigned to students. Presentation and Evaluation: Each student is required to give seminar of 40 minutes each followed by discussion. The topic of the seminar to be given by the department. It is expected that all the Postgraduate students, research scholars of the department attend these seminars. T

References:

1. Ahuja, R. (2001): Research Methods, Rawat Publication, Jaipur & New Delhi.
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3. Baumgartnea, T.A. and Strong, C.H. (1994) Concluding and Reading Research in Health and Human Performance Brown and Benchmark (A division of Wm . C. Brown Communication Inc.)
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15. Morgan, D. (1993): Successful Focus Groups, Sage Publications.
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21. Bryman, A. and Cramer, D. (1994) Quantitative Data Analysis for Social Scientists.
22. Bryman, A. and Cramer, D. (1996): Quantitative Data Analysis with Minitabs. Rutledge, Londong.
23. Cameron, M.E. and Van Staveren, W.A. (1988): Manual on Methodology for Food Consumption Studies. Oxford University Press, Oxford.
24. Quandt, S.A. and Ritenbaubh, S. (1986): Training Manual in Nutritional Anthropology, American Association of Anthropology, Washington, D.C.

PAPER VI

ADVANCED NUTRITIONAL BIOCHEMISTRY II

Hours of Instruction/Week: 6
Duration of Examination: 3 hrs

Max Marks: 50
Main Examination : 40
Continuous Assessment : 10
Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit. All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

UNIT I

1. Vitamins- structure, metabolism and biochemical role-
(i) Water Soluble- B Complex -thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, biotin, folic acid, cyanocobalamin and Vitamin C.
(ii) Fat Soluble- A, D, E, K.
2. Minerals- metabolism, functions, biochemical role -
(i) Macro minerals- calcium, phosphorus, magnesium, sodium, potassium, chloride.
(ii) Trace minerals-iron, zinc, copper, selenium, chromium, manganese, iodine, fluorine, cobalt.

UNIT II

3. Nucleic Acid- synthesis and breakdown of purines and pyrimidines. Structure of DNA and RNA. DNA replication and transcription. Genetic code. DNA repair systems.
4. Recombinant DNA technology. Genetic mutation, regulation of gene expression and protein biosynthesis.
5. Hormones- biochemical role of adrenocorticotrophic hormone, follicle stimulating hormone, luteinizing hormone, human chorionic gonadotropin, growth hormone, thyroxine (T₃, T₄), parathyroid hormone, thyroid stimulating hormone, Insulin, Glucagon, hormones of the Adrenal cortex, male and female sex hormones. Mechanism of action of hormones.

UNIT III

6. Inborn Errors of Metabolism: incidence, clinical changes and treatment of
(a) Disorders of protein metabolism- phenylketonuria, maple syrup urine disease, homocystinuria, albinism, histidinemia, tyrosinemia, and leucine induced hypoglycemia.
(b) Disorders of carbohydrate metabolism- galactosemia, hereditary fructose intolerance, hereditary lactose intolerance, fructosuria, pentoseuria.
(c) Wilson's disease and familial hypercholesterolemia.
(d) Haemoglobinopathies - sickle cell anemia, thalassemias.
7. Use of Isotopes - Radioactive and stable isotopes.
8. Nuclear Magnetic Resonance (NMR) and its Applications

9. Calorimetry
 - (a) Bomb calorimeter
 - (b) Respirography – BMR/RMR

PAPER VI
ADVANCED NUTRITIONAL BIOCHEMISTRY II
PRACTICAL

Hours of instruction/week: 6

Max. Marks: 50
Min. Pass Marks-18

Objectives:

This course will enable the students to:

1. Understand the principles of biochemical methods used for the analysis of food and biological samples.
2. Perform biochemical analysis with accuracy and reproducibility.

Contents

1. Estimation of minerals
 - (a) Serum Calcium
 - (b) Serum Phosphorous
2. Estimation of Vitamins
 - (a) Colorimetric estimation of vitamin A
 - (b) Fluorimetric estimation of Thiamine and Riboflavin
3. Urine analysis- creatine, creatinine, urea, sugar and ascorbic acid (titrimetric) Qualitative tests of normal and abnormal constituents of urine.
4. Chromatographic techniques-demonstration of techniques for-
 - (a) Separation of amino acids or sugars: paper and layer chromatography.
 - (b) Separation of lipids by thin layer chromatography.
 - (c) Separation of fatty acids by Gas chromatography.
 - (d) Fractionation of amino acids by ion exchange chromatography.
5. Electrophoretic technique – demonstration of techniques for-
 - (a) Separation of serum protein by paper electrophoresis.
 - (b) Separation of serum protein by disc gel electrophoresis.
6. Estimation of protein by Microkjeldahl method.
7. Survey of pathological laboratories – to obtain information about the used for blood / serum analysis.

References:

1. West, E.S., Todd, W.R, Nelson, H.S. and Vanbrugger, T.T: Textbook of Biochemistry Oxford and IBH Publishing Corp.
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- tion Harper's Biochemistry Macmillan Work Publishers.
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16. Phemmer D.T (1987): 3rd Edition An Introduction to Practical Biochemistry McGraw Hill Book Co.
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PAPER VII
ADVANCED NUTRITION I

Hours of Instruction/Week: 6
Duration of Examination: 3 hrs
Continuous Assessment : 10

Max Marks: 50
Main Examination : 40
Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit All questions are compulsory . The answer for each question should not exceed twenty words. All questions carry equal marks , each question is of one mark .

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks .

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks .

Objectives:

To enable the students to:

1. Understand the methods to determine body composition
2. Be aware of the current trends in the area of human nutrition requirements- the methods of determining nutrient requirements and current figures of nutritional requirements.
3. Know advances in the field of energy, carbohydrate, lipid and protein nutrition.
4. Understand the importance of vegetarian diet.

Contents

Unit I

1. Nutritional assessment :

- Interpretation and critical evaluation (with respect to sensitivity, specificity and accuracy) of various parameters and indices for the assessment of nutritional status of individuals.
- Direct parameters- Anthropometry, Clinical examination, Biochemical, Biophysical, Dietary surveys.
- Indirect parameters - vital statistics
- Ecological - cultural influences, food production, socioeconomic factors, health and educational services.

2. Nutritional requirements and recommended dietary allowances:

- Definition
- General principles of deriving RDA.

3 Human energy requirements:

- Components of energy requirements.
- Factors affecting energy expenditure and requirements.
- Factors affecting the thermic effect of food.
- Factors affecting the energy expended in physical activity.
- Methods of estimation of energy expenditure and requirements.
- Energy requirements and dietary energy recommendations.
- Deriving energy requirement for different age groups.
- Energy imbalance.

Unit II

4. Carbohydrates:

- Metabolic utilization and functions of carbohydrates.
- Regulation of blood glucose concentration.
- **Resistant starch:** Factors influencing RS content of food and potential health benefits of RS.
- Fructose oligosaccharides (FOS).
- **Glycemic index:** Factors affecting GI of foods and GI in chronic diseases
- Modification of carbohydrate intake for specific disorder (lactose in tolerance and diabetes mellitus).

5. Dietary fiber:

- Components of dietary fiber
- Physiological effects of dietary fiber
- Potential health benefits of dietary fiber
- Recommended intake of dietary fiber
- 6. **Proteins:**
 - Functions of protein.
 - Evaluation of protein quality.
 - Improvement of quality of protein in diet.
 - Methods of estimating and assessing protein requirements at different stages of life cycle.
 - Deriving Nutritional requirements and recommended dietary allowances for different age groups.
 - Hormonal control of protein Metabolism.
- 7. **Lipids:**
 - Transport and storage of fats in the body.
 - Functions of fats and oils.
 - Essential fatty acids.
 - Tran's fatty acids.
 - Role of omega 3 and omega 6 fatty acids.
 - Lipoproteins – classification and their importance.
 - Deriving nutritional requirements of fats and oils for different age groups.

Unit III

8. Body composition:

- Biochemical composition
- Techniques of body composition

(i) Direct Method

(ii) Indirect Method : Nutritional Anthropometry, Body Density, Dilution Techniques and Determination of Body Cell Mass.

- Compositional change during the life cycle.
- 9. **Nutritional requirements for special condition :**
 - Nutritional requirement in high altitude.
 - Nutritional requirement in cold and polar environment.
 - Nutritional requirement in hot environment.
 - Nutritional requirement in space missions.

10. Vegetarianism:

- Importance of vegetarian diet
- Principles of planning nutritionally adequate vegetarian diet
- Role of vegetarian food in health & diseases.

References

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7. Jelliffe, D.B. The Assessment of the Nutritional status of the Community. Monograph Series 53 WHO.
8. Gopal Das T. and Seshadri, S. Nutrition- Monitoring and Assessment- Oxford University Press, New Delhi.
9. Gopalan (Ed.) Recent Trends in Nutrition. Oxford University Press, New Delhi.

Periodicals:

1. Nutrition Abstract & Rev.
2. Wld. Rev. Nutrition Diet.
3. Journal of Nutrition Education.
4. American Journal of Clinical Nutrition.
5. Journal of Biological Chemistry.
6. JAMA.
7. Journal of Chronical Diseases.
8. UMR. 9. American Journal of Physiology.

**PAPER VII
ADVANCED NUTRITION I
PRACTICAL**

Hours of Instruction / week: 6
Duration of Examination : 3 hrs

Max Marks: 50
Min. Pass Marks-18

Objectives:

The aim of the course is to:

1. Familiarize students with basic techniques used in studies and research in nutritional sciences.
2. Acquaint students with the methods of estimating nutrient requirements.
3. Orient students towards planning of metabolic studies.

Contents:

1. **Recommended dietary allowances (RDA), approaches to determine nutrient needs.**
2. **Energy:**
 - Activity 1. Calculating BMR using the kymograph.
 - Activity 2. Calculating the energy balance using factorial method.

- Activity 3. Calculating the energy expenditure using the satyanarayan method.
3. **Estimation of energy value of food stuffs using Bomb calorimeter.**
 4. **Assessment of nutritional status of 0-5 years old children:**
 - Activity 1. Preparation of standard growth chart using weight for age
 - Activity 2. Preparation of standard growth chart using height for age
 - Activity 3. Preparation of standard growth chart using weight for height
 - Activity 4. Assessment of nutritional status using skin fold thickness head & chest circumference & various other indices.
 5. **Evaluation of protein quality:**
 - Activity 1. Calculate the chemical score using SAAP, PAAP Reference protein.
 - Activity 2. Calculate the chemical score and NDP cal % of dishes.
 - Activity 3. Evaluation of the protein quality of dishes.
 - Activity 4. Planning and critical evaluation of suitable dishes for supplementary feeding program.
 - Activity 5. Calculating cereal pulse proportions in a dish to decipher the most suitable combination in terms of the protein quality.
 6. **Balance Studies:**
 - Activity 1. Calcium balance study of an individual.
 - Activity 2. Nitrogen balance study of an individual.
 7. **Animal Experimentation:**
 - Activity 1. Regulation for animal experimentation.
 - Activity 2. Selection of animal species.
 - Activity 3. Factors affecting the experimentation.
 - Activity 4. Nutritional requirements of animals and formulation of diets.
- a) Nutritional requirements
 - b) Classification of diets
 - c) Formulation diets
 - d) Feeding methods
 - + Activity 5. Anaesthesia.
 - + Activity 6. Euthanasia.

References

1. Shills, Mc; Oslan, JA. Shike, M. and Ross, A.C. (editors) (1999) Modern Nutrition in Health and Disease (ninth edition), Williams and Williams. A Waverly Co.
2. Bamji, M.S. Rao, N.P. Reddy. V (editors) (2003) Textbook of Human Nutrition. 2nd Edition Oxford & IBH Publishing co. Pvt. Ltd. New Delhi.
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PAPER VIII

PROBLEMS IN HUMAN NUTRITION

Hours of Instruction/Week: 4

Max Marks: 50

Duration of Examination: 3 hrs

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit. All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives:

This course is aimed at providing an understanding of:

1. Nutritional problems/nutrition related diseases prevalent among the affluent and the less privileged groups with reference to their incidence, etiology and public health significance.
2. Biochemical and clinical manifestations, preventive and therapeutic measures of these nutrition related disorders.

Contents:

UNIT I

1. Pathogenesis of nutritional deficiency diseases development. Primary and secondary nutritional inadequacies, tissue depletion, biochemical lesions, functional changes, anatomic lesions, the concept of acute and chronic deficiency disease. Conditional or secondary nutritional inadequacies, metabolic consequences of starvation.
2. History, prevalence terminology, classification, etiology pathology, bio-

chemical, clinical, manifestations, preventive and therapeutic measures for protein energy malnutrition, leanness, and vitamin A deficiency, fluorosis and dental caries.

3. Historical background, terminology, classification, prevalence, etiology, pathology, biochemical and clinical manifestations, preventive and therapeutic measures for rickets, osteomalacia, osteoporosis, beriberi, pellagra, scurvy, anemia, iodine deficiency disorders,

UNIT II

4. Nutritional problems of affluence- history, prevalence, etiology, biochemical and clinical manifestations, preventive and therapeutic measures for obesity, diabetes, cardiovascular diseases, cancer.
5. Factors controlling intake of food. Role of hypothalamus in regulation of hunger and satiety. Anorexia nervosa, bulimia, naturally occurring toxins and anti nutritional factors in food.

UNIT III

6. Inborn Errors of Metabolism: incidence, clinical changes and treatment of
 - (a) Disorders of protein metabolism- phenylketonuria, maple syrup urine disease, homocystinuria, albinism, histidinemia, tyrosinemia, leucine induced hypoglycemia.
 - (b) Disorders of carbohydrate metabolism- galactosemia, hereditary fructose intolerance, hereditary lactose intolerance, fructosuria, pentoseuria.
 - (c) Wilson's disease and familial hypercholesterolemia.
 - (d) Haemoglobinopathies -sickle cell anemia, thalassemias.
7. Idiosyncrasies- food intolerance and food allergies- definition, symptoms, mechanism of food allergy, diagnosis, history, food record, elimination diets, food selection.
8. Malabsorption syndrome- celiac sprue, tropical sprue, intestinal brush border deficiency, acquired disaccharide intolerance- dietary care in these conditions.

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Journals:

1. World Review of Nutrition and Dietetics, Karger
2. Assual Reviews of Nutrition, Palo Alto, California, USA
3. Nutrition Update Series
4. The Journal of Nutrition
5. UNU, Food and Nutrition Bulletin.

SEMESTER III

PAPER IX

ADVANCED NUTRITION II

Hours of Instruction/Week: 4

Duration of Examination: 3 hrs

Max Marks: 50

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit. All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed

fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks

Objectives:

To enable the students to:

1. Know recent developments in the field of vitamins and minerals.
2. To know the importance of vitamins and minerals in relation to other nutrients.
3. Understand Food components other than essential nutrients
4. To understand the potential health implication and mechanisms of action of functional foods.

Contents:

UNIT I

History, structure, sources, absorption, transport, utilization, storage, excretion, functions, bioavailability, requirements and RDA, deficiency, toxicity, assessment of status and alteration in requirements in various clinical and metabolic disorders.

1. Vitamins: Fat soluble vitamin:

- 1 Vitamin A, D, E, K

2. Vitamins: Water soluble vitamins:

- § Thiamine, Riboflavin, Niacin, Pyridoxine (B6), Folic acid, Cynocobalamin (B12)

UNIT II

3. Minerals (macro minerals):

- ★ Calcium ★ Phosphorous ★ Magnesium ★ Sodium ★ Potassium ★ Chloride

4. Minerals (Micro minerals):

- ★ Iron ★ Zinc ★ Copper

5. Minerals (Micro minerals):

- ★ Selenium ★ Chromium ★ Manganese ★ Iodine ★ Fluorine

UNIT III

6. Metabolic interrelationship between nutrients.

- 1 Protein- energy interrelationship, proximate principles & vitamin interrelationship, vitamin-vitamin, vitamin-mineral & mineral-mineral interrelationship.

7. Antioxidants and Free Radicals:

- 1 Antioxidants
- 2 Role of oxygen free radicals
- 3 Production of oxygen free radicals
- 4 Physiological Mechanisms to limit free radical damage
- 5 Free radical in Human pathology and disease
- 6 Natural and diet derived antioxidants

8. Food components other than essential nutrients:

- 1 Functional foods: classification
- 2 Bioactive substances from protein foods.
- 3 Non glycerides in edible oils.
- 4 Polyphenols. Definition, classification, phenolic acids and derivatives flavonoids, tannins, lignans bioavailability, influence on macro nutrients and minerals and health benefits.
- 5 Phytoestrogens. Dietary sources, chemical forms and physiological effects.
- 6 Other dietary factors with anti nutritional effects: Protease inhibitor, saponins, amylase inhibitor, haemagglutinins or lectins, goitrogens, BOAA(Beta Oxalyl Amino Alanine) and phytates.
9. Naturally occurring toxicants and food contaminants :
 - 1 Lathyrogens, Protease inhibitor, saponins, amylase inhibitor, haemagglutinins or lectins, goitrogens, BOAA(Beta Oxalyl Amino Alanine), Saponine, Carcinogens and phytates.

References:

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2. Bamji, M.S. Rao, N.P. Reddy. V (editors) (2003) Textbook of Human Nutrition. 2nd Edition Oxford & IBH Publishing co. Pvt. Ltd. New Delhi.
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Periodicals:

1. Nutrition Abstract & Rev.
2. Wld. Rev. Nutrition Diet.
3. Journal of Nutrition Education.
4. American Journal of Clinical Nutrition.
5. Journal of Biological Chemistry.

6. JAMA.
7. Journal of Chronical Diseases.
8. UMR.
9. American Journal of Physiology.

PAPER X

NUTRITION FOR VULNERABLE GROUPS

Hours of Instruction/Week: 4

Max Marks:50

Duration of Examination: 3 hrs

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit. All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives:

1. Understand physiological changes in pregnancy and lactation.
2. Get acquainted with growth and development changes from conception till adolescence.
3. Understand the inter-relationship between nutrition and growth and development during life cycle.
4. Familiarize the students with the multifaceted aspects of ageing.
5. Make the students competent for nutritional and health care of the elderly.
6. To enable the students the role of nutrition in vulnerable groups & special group of society.

Contents:

UNIT I

1. The Vulnerable sections of society - who are vulnerable, why they are vulnerable, effects of malnutrition on the vulnerable sections of society: during growth phase, malnutrition in expectant & nursing women, other vulnerable sections of society.
2. Current nutrition & health status of women & children in India - Situation of women in global, national and local context, improving the nutritional and health status, interventions throughout the life cycle.
3. Nutrition in Pregnancy
 - Importance of nutrition prior to (pre maternal period) and during preg-

nancy (pre natal period).

- Pre-requisites for successful outcome. Effect of undernutrition on mother-child including pregnancy outcome and Maternal and Child Health - Short term and Long term.
- Physiology and endocrinology of pregnancy and embryonic and foetal growth and development.
- Nutritional requirements during pregnancy.
- Adolescent pregnancy.
- Intra-uterine growth retardation (IUGR)
- Complications of pregnancy and management and importance of antenatal care.
- Congenital malformation, foetal alcohol syndrome and gestational diabetes mellitus.

UNIT II

4. Nutrition in Lactation

- Development of mammary tissue and role of hormones.
- Physiology and endocrinology of lactation - synthesis of milk components, let down reflex, role of hormones, lactational amenorrhea, effect of breast feeding on maternal health.
- Human milk composition and factors affecting breastfeeding and fertility.
- Management of lactation - Prenatal breastfeeding skill education. Feeding of problems due to - sore nipples, engorged breast, inverted nipples etc., galactagogues
- Exclusive breastfeeding.
- Baby friendly hospitals initiative.

5. Nutrition in Infancy

- Infant physiology, growth and development.
- Nutritional requirements during infancy.
- Breast feeding - Reasons for encouraging breast feeding.
- Artificial feeding - Comparative composition of human & bovine milk, humanization of bovine milk.
- Code on breast feeding and marketing of formula foods.
- Weaning and supplementary feeding.
- Feeding of premature and immature babies, feeding problems.

6. Nutrition in preschool and school children

- Growth and development.
- Nutritional requirements.
- Food behaviour - food habits and common dietary errors.
- Nutritional issues, problems and common diseases.

UNIT III

7. Nutrition in Adolescents

- Physical changes during adolescence.
- Nutritional requirements.

- Food behaviour - food habits and dietary practices.
 - Nutritional problems.
8. Geriatric Nutrition
- The ageing process - Physiological, biochemical and body composition changes.
 - Socio-psychological aspects of ageing - Special problems of elderly.
 - Nutritional requirements of the elderly & dietary management to meet nutritional needs.

9. Nutrition in Industrial workers

- Nutritional requirements.
 - Causes of malnutrition.
 - Measures for improving worker's nutrition
10. Nutrition management in special condition: mentally retarded.

PAPER X

NUTRITION FOR VULNERABLE GROUPS

PRACTICAL

(Internal Assessment)

Objectives:

This course should enable the students to:

1. Understand the physiology of pregnancy and lactation and how these influence nutritional requirements.
2. Learn the benefits of breast feeding.
3. Be aware of the problems encountered in pregnancy and during breast feeding and how to cope with these problems.
4. Understand the process of growth and development from birth until adulthood.
5. Get familiar with the nutritional needs at different stages of growth.
6. Understand the concept of growth promotion.

Contents:

1. Development of weaning & supplementary food from locally available low cost food stuffs.
2. Preparation of nutritious snacks for children, rich in energy, protein & important micronutrient.
3. Preparation of high energy, protein rich & iron rich recipes to be used in supplementary feeding for pregnant & lactating women.
4. Preparation of various recipes for use in diarrhea.
5. Preparation of packed lunch for primary school age, school age children & adolescent.
6. Monitoring growth of children - Weighing & Charting growth.
7. Preparation of bottles for feeding - Sterilization & preparation of formula foods.
8. Planning and preparation of diets for the elderly in health and sickness.
9. Visit to old age homes.
10. Visit to antenatal clinic & counseling mothers at ANC.

11. Counseling mothers for growth promotion.

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PAPER XI FOOD SCIENCE

Hours of Instruction/Week: 6
Duration of Examination: 3 hrs

Max Marks: 50
Main Examination : 40
Continuous Assessment : 10
Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit
All questions are compulsory. The answer for each question should not exceed

twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives:

This course is designed to help students to:

1. Gain knowledge regarding the physical and chemical properties of the food constituents.
2. Understand the chemical reactions and physical changes which occur during the production, processing, storage and handling of foods and their applications.
3. Be familiar with the recent advances and research in the field.
4. To gain the knowledge of techniques involved in new product development.
5. To know the role of food additives and safety issues regarding intake of food additives.
6. To gain knowledge in terms of quality evaluation of food product using sensory and objective evaluation

Content:

UNIT I

- 1) Introduction to Food Science as a Discipline and Modern Developments.
- 2) Colloids, Colloidal System and Applications of Colloidal Chemistry to Food Preparations:
 - a. Classification and Properties of colloidal systems
 - b. Properties of solutions
 - c. Colloidal systems exist in food preparations such as sols, gels, suspensions, foams and emulsions.
- 3) Browning reactions in Foods:
 - d. Enzymatic
 - e. Non-enzymatic browning
- 4) Functional properties of sugars and polysaccharides in terms of their chemical and physiochemical properties –
 - f. The functional role of sugars in foods, artificial and natural sweeteners
 - g. Food polysaccharides and their applications:
 - Characteristics and functional properties of native and modified starches, uses of modified starches in food and confectionary industries.
 - Food hydrocolloids: Classification and functional properties.
 - Non starch polysaccharides: cellulose, carboxymethyl cellulose, hemicellulose and pectin.

UNIT II

5) **Functional properties of proteins in terms of their chemical and physiochemical properties –**

1 Protein concentrates, Isolates and Hydrolysates and their Applications.

6) **Fats and Oils:**

h. Identification of Natural fats and oils

i. Functional properties of food lipids

j. Technology of Edible oils and fats

k. Deteriorative changes in Fats and Oils

l. Preventing the Deteriorative changes in Fats and Oils

7) **Enzymes in food processing:**

m. Carbohydratases

n. Proteases

o. Lipases

p. Oxidoreductases

8) **Natural pigments**

q. Natural Colour used in foods

r. Novel sources of natural colorants (microbial, animal and plant sources)

9) **Functional role of Minerals in food processing.**

UNIT III

10) **Chemical, Physical and Nutritional Alteration Occurring in Foods during Processing and Storage:**

s. Freezing

t. Thermal processing

u. Dehydration

v. Irradiation

w. Microwave heating

x. Ohmic heating.

11) **Food Additives:**

y. Introduction

z. Classification of food additives-antioxidants, preservatives, food Colour, flavoring agents, emulsifying and stabilizing agent's anti-caking agents, sequestrants, buffering agents, antifoaming agents and sweetening agents.

aa. Functional role of different additives.

12) **New food product development:**

bb. Introduction of new food product

cc. What is product development

• Need for product development and

• Classification & characterization of new food product

dd. Product life cycle.

ee. Factors affecting development of a new product.

ff. The process of development.

gg. Future trends in the development of new product.

13) **Evaluation of food quality:**

hh. **Sensory evaluation –**

• Sensory characteristics of food – appearance, color, Flavour, odour, taste, mouth feel, texture.

• Requirements for conducting sensory test – selection of the panel judges, testing laboratory, preparation of samples.

• Methods of sensory testing of foods – (1) difference tests- paired comparison, duo trio, triangle (2) rating tests- ranking test, single sample test, two sample difference test, multiple sample difference test, hedonic rating test, numerical scoring, composite scoring (3) sensitivity tests- sensitivity threshold test, sensitivity dilution test (4) descriptive tests.

ii. **Objective Evaluation –**

• Advantages, Disadvantages and basic directions.

• Methods for objective tests

• chemical method

• physiochemical method

• microscopic examination

• physical method

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**PAPER XI -
FOOD SCIENCE
PRACTICAL**

Hours of Instruction/Week: 6

Max Marks: 50
Min. Pass Marks-18

Objectives:

- 1) Be familiar with Proximate analysis of different foods
- 2) Enable students to use various sensory methods for evaluating variety of foods.
- 3) Enable students to analyze and interpret sensory evaluation data.
- 4) To test different foods for their quality.

1. Qualitative and quantitative techniques- some basic knowledge.

2. Analysis of food stuffs- proximate principles : Introduction

- ★ Moisture
- ★ Protein
- ★ Fat
- ★ Mineral ash
- ★ Crude fiber
- ★ Carbohydrate

3. Experiments on the chemistry of cereals.

- ★ Activity 1. Determination of moisture content.
- ★ Activity 2. Determination of protein – gluten content.
- ★ Activity 3. Determination of fat content.
- ★ Activity 4. Determination of mineral ash content.
- ★ Activity 5. Determination of crude fiber content.
- ★ Activity 6. Determination of carbohydrate content.

- ★ Activity 7. Determination of alcoholic acidity.
- 4. **Experiments based on chemistry of fats and oils.**

- ★ Activity 1. Determination of moisture content
- ★ Activity 2. Determination of iodine value.
- ★ Activity 3. Determination of acid value.
- ★ Activity 4. Determination of peroxide value.
- ★ Activity 5. Determination of saponification value.

5. Evaluation of Milk Samples.

- ★ Activity 1. Determination of specific gravity and percent purity of milk.
- ★ Activity 2. Determination of moisture.
- ★ Activity 3. Determination of Total milk solids.
- ★ Activity 4. Determination of fat content.
- ★ Activity 5. Determination of solid not fat (SNF).
- ★ Activity 6. Determination of protein content by walker formal titration method.
- ★ Activity 7. Determination of milk sugar – lactose by benedicts quantitative method.
- ★ Activity 8. Determination of titrable acidity of milk.

6. Assessment of purity and quality of different food.

- 1 Detection of metanil yellow in a given food sample.
- 2 Check the presence of rhodamine B in the given food sample.
- 3 Test the presence of sugar in honey.
- 4 Detection of NaHCO₃ in flour.
- 5 Check for the presence of vanaspati and rancidity in the ghee.
- 6 Check the milk for presence of protein, urea, sugar and starch.
- ★ Check the presence of mineral oil in the edible oil sample.

7. Development of new product.

- ★ To conduct the market research for various new products available.
- ★ Development of new product using food rich in protein, fiber, calcium, iron, etc..

8. Sensory evaluation of foods

- 1 Design of sensory experiment – selection of panel, types of panel, training of panel, development of score card, data analysis and interpretation of results.
- 2 Determination of test threshold for the different sensations sweet, salty, sour.
- ★ Conduct test to know the acceptability of a new product using rating test.

9. Visits to Commercial food manufacturing units.

References for Practical

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limited Publishers, New Delhi.

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PAPER XII PUBLIC NUTRITION

Hours of Instruction/Week: 6

Max Marks: 50

Duration of Examination: 3 hrs

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit. All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives:

This course will enable the students to:

1. Develop a holistic knowledge base and understanding of the nature of important nutrition problems and their prevention and control for the disadvantaged and upper socio-economic strata in society.
2. Understand the causes/determinants and consequences of nutrition problems in society.
3. Be familiar with various approaches to nutrition and health interventions, programmes and policies.

Contents:

UNIT I

1. (a) Definition and key concepts – community, nutritional anthropology, community health & community nutrition,
- (b) Health care-concept, levels, primary health care, and health care delivery
- (c) Role of public nutritionists in the health care delivery.
- (d) Ecology of Health – Determinants of community health and nutrition – environment, infection, health services, health behavior etc.
- (e) Specific determinants of food behavior – sensory characteristics affecting food selection, availability, socio- cultural, economical, psychological, food beliefs etc.
2. Population Dynamics – Demography, Demographic transition, population structure-sex composition, age composition, fertility behavior, population

policy, fertility, nutrition and quality of life – interrelationship.

3. Health Economics and Economics of malnutrition – Malnutrition-causes, consequences, indicators, interventions in malnutrition and government expenditure on interventions. Impact on national development. Cost-benefit, cost effectiveness and cost efficiency.
4. Magnitude and background of the problem of malnutrition in India.
5. Primary health care of the community - National health care delivery system, determinants of health status, indicators of health.

UNIT II

6. Nutritional status-
 - (a) Determinants of nutritional status of individual and populations; Nutrition and non-nutritional indicators.
 - (b) Direct parameters-an overview.
 - (c) Indirect parameters - mortality and morbidity profile - role of vital and health statistics in public health, sources of data. Socioeconomic indices-purchasing power, agricultural production, availability, distribution, storage of food stuffs etc. Nutrition beliefs and practices (KAP) of people.
 - (d) Planning and conducting a nutritional status assessment survey:
 - i. Defining scope and objectives of survey, defining population and selecting samples.
 - ii. Selecting and standardizing parameters.
 - iii. Executing the survey-organizing team, materials, training and field testing of method of verification and cross checking of data. Interpretation of data and reporting.
 - iv. Monitoring and evaluation.
7. Nutrition monitoring and nutrition surveillance- objectives, uses, infrastructure, key indicators and current programs.
8. Food and Nutrition Security-Definition, need, levels, Food production, access, distribution, availability, losses, consumption, population, food policy, food utilization, food pricing. Role of government in maintaining food security and nutrition security in India.
9. National Food and Nutrition Policies, Plan of Action and Programmes -a review & critique of major national nutrition programmes
 - National nutrition policy
 - ICDS
 - Nutrient deficiency control programs
 - Supplementary feeding programs
 - Food security programs
 - Self employment & wage employment schemes
 - Others

UNIT III

10. International agencies & nutrition programs.
11. Approaches and Strategies for improving nutritional status & health: Programmatic options – their advantages and demerits. Feasibility, available resources (human financial & infrastructural) and support. Case studies of selected strategies and programmes: their rationale and context, selection of interventions from a range of possible options.

- Health based intervention (primary health care & family welfare programmes)
 - Food based interventions including fortifications, genetic improvements of foods and supplementary feedings.
 - Nutrition education for behavior changes. Participatory training.
12. Community Nutrition Programme Management-
- (a) Planning – identification of problem, analysis of causes, resources, constraints, selection of intervention, setting a strategy.
 - (b) Implementation and supervision
 - (c) Operations monitoring, surveillance and evaluation (process & impact evaluation).
13. Nutrition education-need, channels, sectors, methods.
14. Nutrition in emergency situations - disaster, hazards, famine.

PAPER XII
PUBLIC NUTRITION
PRACTICALS

Hours of instruction per week: 4

Max. Marks: 50
Min. Pass Marks-18

Contents:

1. Comparison of rural, urban and tribal communities for:
 - (a) Determinants of malnutrition
 - (b) Socio-economic groups
 - (c) The types of nutritional problems in different segments and age groups through analysis of secondary data.
2. Identification of nutritional problem and strategies to tackle the problem in vulnerable group-Training in Nutritional status assessment techniques and Community based Projects.
3. Development of low cost nutritive recipes suitable for various vulnerable groups at micro, meso and macro levels.
4. Development of nutrition material and their evaluation
 - (a) Charts, posters, flash cards, flip charts and other IEC materials for nutrition and health education messages.
 - (b) Use of Demonstration as a technique for Nutrition Education
 - (c) Analysis and critical appraisal of a TV/ Video film (presented before the class).
5. Formulation of nutrition education tool to assess knowledge, attitude and practices.
6. (a) Critical Appraisal of existing interventions and programmes in the voluntary sector and the government, and suggestions to improve the same vis-à-vis target groups in society and specific needs.
- (b) Surveillance systems used in Nutritional and Health programmes.
7. Development of a plan for a nutrition intervention project in the community (The target groups need to be specified). Implementation of intervention for 2-4 weeks followed by assessment of impact. Reporting on impact

and possible improvements.

8. Field experience in operational public nutrition programmes: nutrition rehabilitation centres, fortification programmes, cost analysis.

References:

1. Owen, A.Y. and Franke, R.T. (1986): Nutrition in the Community, The Art of Delivering Services, 2nd Edition Times Mirror/Mosby.
2. Park, K. (2000): Park's Textbook of Preventive and Social Medicine, 18th Edition, M/s. Banarasidas Bhanot, Jabalpur.
3. SCN News, UN ACC/SCN Subcommittee on Nutrition.
4. State of the World's Children, UNICEF.
5. Berg, A. (1973): The Nutrition Factor, the Brookings Institution, Washington.
6. Beaton, G.H. and Bengoa, J.M. (Eds) (1996): Nutrition in Preventive Medicine.
7. Bamji, M.S., Rao, P.N., Reddy, V. (Eds) (2003): Textbook of Human Nutrition, 2nd Edition. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
8. Gopalan, C. and Kaur, S. (Eds) (1989): Women and Nutrition in India, Nutrition Foundation of India.
9. Gopalan, C. and Kaur, S. (Eds) (1993): Towards Better Nutrition, Problems and Policies, Nutrition Foundation of India.
10. Gopalan, C. (Ed) (1987): Combating Undernutrition – Basic Issues and Practical Approaches, Nutrition Foundation of India.
11. Achaya, K.T. (Ed) (1984): Interfaces between agriculture Nutrition and Food Science, The United Nations University.
12. National Family Health Survey I & II (1993, 2000): International Institute for Population Studies, Mumbai.
13. National Policy of Action on Nutrition (1995): Food & Nutrition Board, Dept. of WCD, Govt. of India.
14. National Nutrition Policy (1993): Dept. of WCD, Govt. of India.
15. Nutrition Education for the Public (1997): FAO Food and Nutrition Programme, 62, FAO.
16. NIN (1998): Dietary Guidelines for Indian as Manual National Institute of Nutrition, Hyderabad.
17. Mason, J.B., Habicht, J., Tabatabai, and Valverde, (1984): Nutritional Surveillance World Health Organisation Geneva.
18. Gopalan, T. and Sheshadri, S. (1987): Nutrition – Monitoring and Assessment Oxford University Press. N. Delhi.
19. Who (1998): Education for Health – A Manual on Health education in Primary Health care, WHO.
20. Toreis, K. and Tilford, S. (1994): Health Education Effectiveness, Efficiency and Equity (2nd edition) Chapman & Hall London.
21. Wadhwa, A; Sharma, S (2003): Nutrition in the community, A Textbook, Elite publishing HOuse Pvt. Ltd. New Delhi.
22. Seghal, S; Raghuvanshi, R (2007): Textbook of community nutrition, Indian council of agricultural research, New Delhi.

SEMESTER IV**PAPER XIII - CLINICAL AND THERAPEUTIC NUTRITION**

Hours of Instruction/Week: 6

Max Marks: 50

Duration of Examination: 3 hrs

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit. All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Objectives:

This course will enable the students to:

1. Understand the etiology, physiology and metabolic anomalies of acute and chronic diseases and patient needs.
2. Know the effect of the various diseases on nutritional and dietary requirements.
3. Be able to recommend and provide appropriate nutritional care for prevention and treatment of various diseases.

Contents:**UNIT I**

1. Concepts of Diet Therapy- growth of dietetics and principles of Therapeutic diets. Modifications of normal diet. Classification of Therapeutic diets.
2. Role of dietitian, definition of nutritional care, Nutritional care process- nutritional assessment, diagnosis, intervention, monitoring and evaluation. Documentation, interpersonal relationship with the patient, assessment of nutritional status of outdoor and indoor patients. Identification of high risk patients. Assessment of patient needs based on interpretation of patient data- clinical, biochemical, bio- physical & personal. Planning and implementing dietary care.
3. Recent advances and techniques in feeding substrates. Study and review of hospital diets- basic concepts and methods in oral feeding, tube feeding, enteral, par-enteral feeding. Complications of Nutritional support systems including Refeeding Syndrome.
4. Diet in Stress and Surgical conditions- Stress response, physiological response to surgery, pre and post operative nutritional care Dumping syndrome. Burns-

complications, nutritional requirement and dietary management

5. Obesity- etiology, classification, energy balance, metabolic aberrations and clinical manifestations, complications, treatment(dietary and lifestyle modifications, pharmaceutical management, surgical management), preventive aspects Underweight- Etiology, metabolic aberrations and clinical manifestations, dietary management
6. Diet in fevers and infections- types of fevers, defence mechanism in the body, nutrition and infection, metabolism in fevers, general dietary considerations, diet in ,typhoid, AIDS and tuberculosis.

UNIT II

7. Diet in gastritis, peptic ulcer (gastric and duodenal). Etiology, symptoms, clinical findings, treatment, dietary modifications, chemical, mechanical, thermal irritants.
8. Nutritional Management of GIT Diseases and Disorders - Diarrhea, Constipation, Oesophagitis Gastro Esophageal Reflux Disease (GERD) Dyspepsia, Gastritis, Diverticular Disease, Malabsorption Syndrome (Celiac disease, steatorrhoea, lactose intolerance, inflammatory bowel disease). Dietary considerations in ulcerative colitis-symptoms, dietary management.
9. Diet in diseases of the liver, gall-bladder and pancreas- basic hepatic functions, etiology, symptoms and dietary management in hepatitis, viral hepatitis A and B, cirrhosis of liver and hepatic coma and hepatic encephalopathy. Role of alcohol in liver diseases. Dietary treatment in cholecystitis, cholelithiasis and pancreatitis- acute and chronic.
10. Diabetes: etiology, classification, metabolism, factors affecting normal blood sugar levels, diagnosis, signs and symptoms, types of insulin, meal management, dietary treatment, glycemic index, oral hypoglycemic drugs, sweeteners- nutritive and non-nutritive, role of exercise, education at alcohol, short and long term complications of diabetes. Prevention of diabetes.
11. Diet in Renal Diseases- basic renal function, assessment of kidney function, etiology, clinical and metabolic manifestations and dietary management in acute and chronic glomerulonephritis, nephrotic syndrome, acute and chronic renal failure- End Stage Renal Disease (ESRD), Renal calculi- etiology, clinical symptoms, dietary management, dietary sources of various constituents of renal calculi. Dialysis - hemodialysis and peritoneal dialysis.

UNIT III

12. Diet in cardiovascular diseases- prevalence, etiology- cardiovascular risk factors, pathophysiology of CVD, common disorders of CVD and their management, Dyslipidemia, atherosclerosis, angina pectoris, myocardial infarction, rheumatic heart disease. prevention of CVD.
13. Diet for hypertension- primary and secondary hypertension. Role of renin in development of hypertension. Dietary management. Low sodium diets.
14. Nutritional Management of Neurological disorders- Common Neurologi-

cal disorders, general goals of nutritional care, Dysphagia, Alzheimer's disease, Parkinson's disease, Epilepsy

15. Nutrition Education and Diet Counseling.
16. Diet and Drug Interaction- effects of drugs on food and nutrient intake – ingestion, digestion, absorption, metabolism and requirements. Effects of food, nutrients and nutritional status on absorption and efficacy of drugs.
17. Nutrition and Cancer- nutrition for the cancer patient, role of diet in cause of cancer, metabolic effects of cancer, cancer cachexia, nutritional effects of cancer therapy.

PAPER XIII CLINICAL AND THERAPEUTIC NUTRITION PRACTICAL

Hours of Instruction/week: 4

Max Marks: 50

Min. Pass Marks-18

1. Market survey of commercial nutritional supplements and nutritional support substrates.
2. Planning and preparation of diets using the food exchange lists and food compositions with modifications in:
 - a). Consistency. b). Fiber and Residue. c). In Diarrhea
 - d). For Peptic Ulcer e). For Liver diseases. f). For Obesity
 - g). For fevers and infections
 - h). For Insulin and non-insulin dependent diabetes.
 - i). For cardiovascular diseases. j). For kidney diseases.
 - k). Trauma (burns) l). Surgery.
3. Preparation of Diet Counseling aids for common disorders.
4. Case Studies: Selection of 3 to 5 admitted patients from a unit of a Hospital. Study of clinical, nutritional, biochemical profile of the patient on admission, during hospital stay and at discharge. Therapeutic Modification of the diet for that condition. Dietary counseling of the patients. Study of acceptability and compliance of diet planning, maintenance diets on discharge. Report writing.

References:

1. Mahan, L.K. and Escott-Stump, S. (2000): Krauses Food Nutrition and Diet Therapy, 11th edition, W.B. Saunders Ltd.
2. Shils, M.E, Olson, J.A, Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease 9th edition. Williams and Wilkins.
3. Escott-Stump S (1998): Nutrition and Diagnosis Related Care 4th edition. Williams and Wilkins.
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10. Fauci, S.A *et al* (1998): Harrison's Principle of Internal Medicine, 14th edition, McGraw Hill.
11. World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer-A Global perspective, Washington E.D. WCRF.
12. Robinson C.H and Lawler M.E. *et al* Normal and Therapeutic Nutrition. 17th edition Mac Millan Pub Co 1986.
13. Williams S.R Nutrition and Diet Therapy C. V Mosby Co 1973.
14. Antia F.P. Clinical Dietetics and Nutrition 3rd edition, Oxford University Press, Bombay 1989.
15. Beaton G.H. and Bengoa J.M. Eds. WHO Monograph Series 62 1976.
16. FAO, WHO Monograph and Technical Series.
17. Seth, V. and Singh K. Diet Planning Through Lifestyle in Health and Disease. A Practical Manual Blaze Publisher and Distributor, New Delhi, 1993.
18. Davidson, A. Passmore, R. Brock J.F. and Truwell, A.S. Human Nutrition and Dietetics. English language Book Society and Churchill Livingstone 1975.
19. Srilakshmi S. Dietetics 1999.
20. WHO (1995) Diabetes Mellitus WHO Technical Report Series 727 WHO (Geneva).

Journals:

1. Indian Journal of Nutrition and Dietetics.
2. Journal of Dietetic American Association.
3. Nutrition Update Series.
4. American Journal of Clinical Nutrition
5. European Journal of Clinical Nutrition
6. Nutritional Reviews
7. World Review of Nutrition and Dietetics
8. Journal of Applied Nutrition
9. WHO Expert Committee-TRS.

PAPER XIV

INSTITUTIONAL FOOD ADMINISTRATION

Hours of Instruction/Week: 6

Max Marks: 50

Duration of Examination: 3 hrs

Main Examination : 40

Continuous Assessment : 10

Min. Pass Marks-18

Note: The question paper will be divided into three parts - A B C

Part A- This part is of 8 Marks. Eight questions are to be set at least 2 from each Unit. All questions are compulsory. The answer for each question should not exceed twenty words. All questions carry equal marks, each question is of one mark.

Part B- This part is of 8 Marks. Four questions are to be set at least one from each Unit. All questions are compulsory. The answer for each question should not exceed fifty words. All questions carry equal marks, each question is of two marks.

Part C- This part is of 24 Marks. Six questions are to be set, that is two from each Unit. The candidates have to answer any three questions choosing at least one Question from each Unit. The answer for each question should not exceed four hundred words. All questions carry equal marks, each question is of 8 marks.

Contents:

UNIT I

Food service system and management

1. Food service system –

- (i) Introduction to food service system
- (ii) Evaluation of the food service industry
- (iii) Characteristics of the various types of food service units – commercial, institutional, hospital, military, any other
- (iv) Scope and development of food service institution in India
- (v) Effects of environmental changes on different types of establishments

2. Food service management

- (a) Definitions, principles and functions of Management
- (b) Approaches to management – traditional, system approach, management by objectives
- (c) Financial management –
- (i) Definition, application of management accounting to catering operations
- (ii) Budgeting, determining the financial needs sources
- (iii) Book-keeping and accounting

3. Food service organization

- (a) Definition and types of organization in food
- (b) Tools of organization Chart, job description, job specification, work schedule and communication
- (c) Recruitment, induction, training, motivation and performance appraisal of personnel

(d) Administrative leadership

4. Planning and service of food

- (a) Menu planning
- (i) Types of menu structure
- (ii) Factors affecting menu planning
- (iii) Menu evaluation

UNIT II

5. Delivery and service of food

- (a) Food service system Conventional, commissary, assembly service
- (b) Service of food
- Self-service, tray service, waiter service, portable meals, banquets
- (c) Food service in selected types of organizations
- Hospitals, schools, colleges, industrial canteens, airlines and space

using (i) Customer relationships

6. Quality and Quantity control

- (a) Construction and selection of recipes by quantity cooking
- (b) Standardization of recipe, recipe format and adjustment
- (c) Product standard and production control
7. Food cost accounting / Analysis
- (a) Importance of costing and food cost control
- (b) Methods of costing
- (c) Cost classification into materials, labor and overheads and their percentage analysis
- (d) Reports and trend analysis

8. Food purchasing, selection and storage

- (a) Purchasing –
- (i) Forecasting, product selection, purchasing, specification
- (ii) Methods and procedure of purchasing
- (b) Receiving –
- (i) Elements of receiving process
- (ii) Inventory control
- (c) Storage –
- (i) Dry
- (ii) Refrigerated and cold storage

9. Organization of space –

- (a) Kitchen –
- (i) Types
- (ii) Designing – location, work surface, lightning, modes of ventilation, work centers and safety and sanitation
- (b) Storage spaces – location, ventilation, safety and sanitation
- (c) Service areas

UNIT III

10. Equipment planning, selection and purchasing

- (a) Steps in planning
- (b) Determining equipment
- (c) Factors affecting selection
- (d) Methods of purchasing
- (e) Layout analysis
- (f) Maintenance and care of equipment

11. Sanitation

- (a) Personal hygiene of the personnel

- (b) Sanitation related to handling of food and serving
- (c) Disinfectants – definition, types and uses

12. Prevention of food spoilage

- (a) Techniques of correct storage
- (b) Storage temperature of different commodities to prevent bacterial contamination and spoilage

13. Laws governing food service institutions

- (a) Food laws, labor laws, laws concerning hygiene, safety and implementation
- (b) Employee welfare schemes

14. Computer assisted management

- (a) Use of computer in menu planning
- (b) Inventory and purchasing application
- (c) Production control application

References:

Management

1. West, B Bessie & Wood, Levelle (1988): Food service in institutions 6th Edition. Revised by F.V., Shuggart S.G. & Paigne-Palacio June Macmillian Publication company New York.
2. Sethi Mohini (1993): Catering Management An integrated approach 2nd Edition, Wiley publication.
3. Kotas Richard & Jayawardardene, C., (1994): Profitable Food and Beverage Management, Hodder Stoughton Publication.
4. Brodner, J., Maschal, H.T., Carlon, H. M. (1982): Profitable Food and Beverage Operation 4th Edition, Hayden Book company New Jersey.
5. Green, E. F., Drake, C.G., Sweeny, J.F. (1972): Profitable Food and Beverage Management, Planning Operatio Hayden Book company New Jersey.
6. Knootz, H.O., Donnel C (1968): Principles of Management, McGraw Hill Book Company.

Personnel Management

7. Desseler, Garry (1987): Personnel Management Modern ,Concepts and Techniques, Prentice Hall New Jersey
8. Kumar, H.L. (1986): Personnel Management in Hotel and Catering Industries, Metropolitan Book Company N. Delhi.
9. Hichock, M.J. (1980): Food Service System Administration, Macmillian Publishing Company.

Cost Control

10. Keiser, J. & Kaillo, E. (1974): Controlling and Analysis Of Cost in Food Service Operations, Wiley and Sons N. York.
11. Khari, W.L. (I) (1977): Introduction to Modern Food and Beverage Service. (1979) Advanced Modern Food and Beverage Service, Prentice Hall Series.
12. Coltman, M.M. (1977): Food and Beverage Cost Control, Prentice Hall Series.
13. Levison (1976): Food and Beverage Operation Cost Control & System Management, Prentice Hall Series.

PAPERXIV

INSTITUTIONAL FOOD ADMINISTRATION PRACTICAL

Hours of Instruction/week:5

Max. Marks: 50
Min. Pass Marks-18

Contents:

1. Market survey and analysis of processed and finished products.
2. Evaluation of food service units – Conventional organizational, hierarchy, staff benefits, floor plans, equipments, Commissary staff management, menu structuring, styles of service. A report of visits made to these institutions.
3. Market survey of food service equipment.
4. Layout analysis of kitchens of small & big restaurants, hotels.
5. Quantity cooking :concept ,principles and techniques.
6. Standardizing recipes for quantity cookery- for 100, 250 & 500 or more servings
7. Planning and organization of meals for institutional feeding:
 - (a) Running weekly canteens
 - (b) Hostel mess
 - (c) Mid day snacks for school children
8. Planning and organization for industrial catering
 - (a) airlines
 - (b) Indian Railways
 - (c) Industrial workers
9. Catering for special occasions and events-
 - (a) Birthday party (b) Cocktail party (c) Banquet party
10. Cost analysis of menus in
 - (a) College Canteen
 - (b) Hostel Mess
 - (c) Hospitals (private, charitable & government)
11. The restaurant – basic etiquettes of Restaurant staff – setting up the restaurant, laying of table cloth, setting the silvers, other table appointments, folding of serviettes, setting the side board.
12. Types of food services. Clearing practices.
13. Beverages & beverage Service – serving of alcoholic & non alcoholic aerated & non aerated beverages.
14. Tray Service
15. Order taking, bill making & presentation of bills.

**PAPERXX
DISSERTATION**

Max Marks:100

Main Examination: 50
Internal Assessment : 50

Every student should be allotted a research supervisor. The Research Supervisor will be from the department and if required the minor guide, from the same department or any other department to which the topic may be related. The allotment of the Research Supervisor will be done during the Second Semester. The topic of research will be decided by the research Supervisor in consultation with the Head of the Department during the second semester. It is the responsibility of the research supervisor that the student is making the required progress in work.

The student will have to give a seminar on the research proposal and a seminar on the findings of research before submitting the Dissertation. The suggestions and constructive criticism of the faculty should be made use of by the student for further improving the draft of the Dissertation.

The study must be completed and submitted in the form of Dissertation by the end of the final year. Normally, the M.Sc. Dissertation is expected to cover 60 - 80 pages of A4 size, excluding bibliography and appendices. Five copies of the same should be submitted to the Head of the Department through the major guide, by the date announced. Each student submitting a Dissertation must also submit five copies of the abstract of his/her dissertation not exceeding 400 words, excluding the title. Marks will be awarded, for research seminars/practical exercises and viva-voce examination. Viva-Voce examination will be conducted by the panel of Examiners.

INTERNSHIP

Internship/Field placement Project

The students will be required to undergo an internship/field placement for a total duration of 4-6 weeks in their chosen Area of interest/specialization/ optional Group that will facilitate their pursuing a professional career in the same field. This program could be taken up either as a single block or in two different blocks. It is mandatory that the organization/institute (public/private) participating in the field placement programme be of good professional standing. It could include recognized dietary department of a teaching hospital/supervision under a Registered Dietitian in a hospital/Diet Clinic/NGO Administered Public Nutrition programme/Food Industry etc. The students will be required to submit and present a report of the internship/ field placement project. It is also envisaged that the participating organization/ institution will give the performance appraisal of the students work.

This programme is designed with the following objectives -

1. To enable the students to acquire an in depth understanding of the practical aspects of knowledge and skills acquired during the course work in the relevant subject/subjects.
2. To gain hands on experience for higher proficiency in their selected area of expertise.
3. To help the students to develop and have their analytical abilities for situation analysis and to devise means and ways to improvements in the existing system.

