PERIYAR UNIVERSITY

Periyar Palkalai Nagar, Salem-636011

Department of Nutrition and Dietetics

M.Sc. Clinical Nutrition and Dietetics

[Choice Based Credit System (CBCS)]

REGULATIONS AND SYLLABUS
(w.e.f. 2022-2023)

VISION

To impart a solid understanding of standards of clinical nutrition and dietetics practice and develop essential leadership skills to play a pivotal role to promote nutrition and healthy lifestyle choices in our society and beyond.

MISSION

- To develop experts in clinical nutrition practice from a wide range of perspectives within the health system, from disease prevention to palliation.
- To generate a team of well-equipped clinical nutrition practitioners to help the community in maintenance of optimal health and well-being.
- To expose students to research and practice in the field of nutrition and dietetics by developing newer food formulas in the prevention and treatment of lifestyle diseases.

PROGRAM SPECIFIC OUTCOME (PSO)

The Post Graduates of Clinical Nutrition and Dietetics Program will be

PSO1: Using domain knowledge and procedural assertiveness of clinical nutrition and dietetics and relevant disciplines to develop robust society.

PSO2: Applying principles of diet when planning food and nutrition programmes and supervising meal preparations in hospitals and other food service establishments.

PSO3: Educating the community on recommended dietary modifications based on the severity of illness and complications of disease.

PSO4: Exhibiting constant enhancement in their profession through life-long learning thereby escalating human wellness either as sovereign patient counsellors or as a team with multidisciplinary healthcare approach.

Graduate Attributes (GA) for Clinical Nutrition and Dietetics Programme

1. GA1: Obtain the knowledge of clinical nutrition and dietetics, and work independently as self-driven, lifelong learners and innovators so as to prevent or treat diseases being faced by the humans.

2. GA2: Work in association with the health care team and apply the knowledge of the subject in novel situations to solve new problems.

3. GA3: Think critically and apply appropriate contemporary research techniques, resources and modern devices to compute nutritional needs with appropriate consideration for public health and safety, food safety and security.

4. GA4: Identify and evaluate the needs of the society significant with food in all contexts, like food safety and security, health and sanitation, environment, and gender concerns.

5. GA5: Dynamic involvement in the community settings and working towards the attainment of wholesome nutritious communal along with the administrators.

Programme Outcomes (PO) for Clinical Nutrition and Dietetics

On completion of M.Sc. programme, the students are expected to

PO1: Critical Thinking: Acquire the knowledge of clinical nutrition and dietetics, relate to scientific issues so as to prevent or treat diseases being faced by the humans. Identify, formulate, research literature, and solve nutritional deficiencies using fundamentals of clinical nutrition and dietetics, physiology, food science and biochemistry and relevant domain disciplines. Create, select, adapt and apply appropriate techniques, resources and modern devices to compute nutritional needs with a thoughtfulness of the limitations**.**

PO2: Effective Communication: Researching and informing the patient and the healthcare team the complexity of the disease, the burdens of feeding and the decisions that may help determine the route of care for the patient, such as more aggressive or palliative care. Also, by effective report writing, presentations and documentations, communicate efficiently with the needy about the importance of healthy individual and society.

PO3: Social Interaction: Recognize and assess societal, environmental, health, safety, and cultural issues related to food within local and global contexts.

PO4: Effective Citizenship: Active in the patients care as the consultant dietician or community dietician or in a medical team reporting on the nutritional status of the patient or community to the health governing bodies.

PO5: Professional Ethics: Hold up and commit to professional ethics and ethical regulations, responsibilities, and norms of professional nutrition and dietetics practice.

PO6: Sustainability: Develop innovative food products or substitutes or alternate solutions to create value and wealth for the betterment of the individual and society at large.

PO7: Self Directed and Life Long Learning: Recognize the need and have the ability, to engage in independent learning for continual development as a health professional.

PSO-PO Mapping:

PSO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
PSO1							
PSO2							
PSO3							
PSO4							

PO-GA Mapping:

PO/GA	GA1	GA2	GA3	GA4	GA5
PO1					
PO2					
PO3					
PO4					
PO5					
PO6					
PO7					

Program Educational Objectives (PEO):

At the end of the program the students will obtain:

PEO1: Technical Proficiency

Succeed as clinical nutritionist, dieticians and will become productive and valued professionals in the sphere of Medical Nutrition Therapy.

PEO2: Professional Growth

Continue to develop as promising healthcare connoisseurs through life-long learning and higher education in the field of nutrition and dietetics.

PEO3: Management skills

Exercise entrepreneurial qualities in a responsive, ethical and innovative manner by setting up own diet clinics.

POs Consistency with PEOs

PEO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
PEO1	✓	✓	✓	✓	✓	✓	
PEO2	✓	✓	✓	✓	✓	✓	✓
PEO3							✓

DEPARTMENT OF NUTRITION AND DIETETICS
M.Sc. CLINICAL NUTRITION AND DIETETICS
SYLLABUS - Choice Based Credit system (CBCS)

Subject code	Title of the Paper	Weekly contact Hours	L	T	P	Credits	Internal Marks	External Marks	Total Marks
SEMESTER –I									
22UPCND1C01	Human Physiology	5	4	1	-	5	25	75	100
22UPCND1C02	Applied Food Science	5	4	1	-	5	25	75	100
22UPCND1C03	Human Development and Nutrition	5	4	1	-	5	25	75	100
22UPCND1C04	Clinical Nutrition and Dietetics -I	5	4	1	-	5	25	75	100
22UPCND1CP01	Computer Applications in Human Development and Nutrition practical	3	-	-	3	2	40	60	100
22UPCND1CP02	Computer Applications in Clinical Nutrition and Dietetics –I Practical	3	-	-	3	2	40	60	100
22UPCND1E-----	Elective –I	4	3	1	-	4	25	75	100
22UPCND1SM01	SWAYAM/MOOC online course -I	-	-	-	-	2	-	-	-
	Total	**30**				**30**	**205**	**495**	**700**
SEMESTER –II									
22UPCND1C05	Clinical Biochemistry	6	4	1	-	5	25	75	100
22UPCND1C06	Clinical Nutrition and Dietetics-II	5	4	1	-	5	25	75	100
22UPCND1CP03	Clinical Biochemistry Practical	3	-	-	3	2	40	60	100
22UPCND1CP04	Computer Applications in Clinical Nutrition and Dietetics –II Practical	3	-	-	3	2	40	60	100
22UPCND1E------	Elective –II	4	3	1	-	4	25	75	100
22UPCND1E------	Elective –III	4	3	1	-	4	25	75	100
22UPSOC2H01	Fundamentals of Human Rights	2	2	-	-	2	25	75	100
	Total	**27**				**24**	**205**	**495**	**700**
SEMESTER –III									
22UPCND1C07	Research Methods & Statistical Applications	5	4	1	-	5	25	75	100
22UPCND1C08	Public Health Nutrition	5	4	1	-	5	25	75	100
22UPCND1C09	Nutraceuticals and Functional Foods	5	4	1	-	5	25	75	100
22UPCND1C10	Nutrition For sports and Exercise	5	4	1	-	5	25	75	100
22UPCND1CP05	Nutraceuticals and Functional Foods Practical	3	-	-	3	2	40	60	100
22UPCND1S01	Supportive –I	4	4	-	-	4	25	75	100
22UPCND1SC01	Skill Based Industrial Courses / **Internships Hospital Dietary Internship Training (Mandatory during summer vacation)**	60 days				-	-	-	-
22UPCND1V01/ 22UPCND1V02/	Value Added Course					1 (Extra)			
	Total	**27**				**26**	**165**	**435**	**600**

SEMESTER –IV									
22UPCND1C11	Hospital Administration and Practices	5	4	1	-	5	25	75	100
22UPCND1E------	Elective-IV	4	3	1	-	4	25	75	100
22UPCND1CPR01	Project and Viva-voce	21	-	21	-	5	50	150	200
	Total	**30**				**14**	**100**	**300**	**400**
Total						**94**	**675**	**1725**	**2400**

***Total weekly contact hours: 120** **Total number of credits: 94**

- **II Semester- 3 hours are allotted for Library, Seminar and Special class for slow and advanced learners.**
- **III Semester- 3 hours are allotted for Library, Seminar and Special class for slow and advanced learners.**

List of Elective courses

Subject code	Title of the Paper	Weekly contact Hours	Credits	Internal Marks	External Marks	Total Marks
22UPCND1E01	Home Science Education and Communication	4	4	25	75	100
22UPCND1E02	Food Microbiology and Safety	4	4	25	75	100
22UPCND1E03	Extension Education	4	4	25	75	100
22UPCND1E04	Food Properties	4	4	25	75	100
22UPCND1E05	Entrepreneurship in Clinical Nutrition	4	4	25	75	100
22UPCND1E06	Nutritional Counselling and Techniques	4	4	25	75	100
22UPCND1E07	Food Analysis and Instrumentation	4	4	25	75	100
22UPCND1E08	Food Service Management	4	4	25	75	100

List of Supportive Papers for other PG courses

Subject code	Title of the Paper	Weekly contact Hours	Credits	Internal Marks	External Marks	Total Marks
22UPCND1S01	Diet Therapy in Life Style Diseases	4	4	25	75	100
22UPCND1S02	Nutrition Science	4	4	25	75	100

List of Value -Added Courses

Subject code	Title of the Paper
22UPCND1V01	Space Nutrition
22UPCND1V02	Principles of Epidemiology in Nutrition

SWAYAM/MOOC online courses (Preferable)

1. Home Science
2. Communication Technologies in Education
3. Science of Clothing Comfort
4. Principles of Human Resource Management
5. Child Development

6. DETAILS OF THE COURSE

1.	No. of Core papers with practical's	:	16
2.	No. of Elective papers	:	4
3.	Supportive courses-Non-Major	:	1
4.	SWAYAM /MOOC online courses	:	1

5.	Skill based industrial course-Hospital Dietary Internship Training	:	1
6.	Project and Viva voce	:	1
7.	Human Rights	:	1
8.	Value added course	:	1

7. SCHEME OF EXAMINATIONS

The scheme of examinations for different semesters shall be as follows:

Theory Paper
External: 75 Marks
Internal : 25 Marks
Total : 100 Marks
Time : 3 hours

Pattern of Question Paper:

PART – A -Objective type; answer all questions 20 X 1 =20 Marks

PART – B -Analytical Questions (3 out of 5) 3X 5 =15 Marks

PART – C -Either or type descriptive questions 5 X8 =40 Marks

Procedure followed for Internal Marks:
For Theory Papers

Best two out of three tests: 10 Marks
Seminar : 5 Marks
Assignment : 5 Marks
Attendance : 5 Marks

Total : 25 Marks

For Practical's

Practical Internal
Best two out of three tests: 40 Marks
Total : 40 Marks

External : **60 Marks**

For Project and *viva voce*

Components of evaluation are as follows

Component – I (C1) : Periodic Progress and progress reports (25 marks)

Components – II (C2) : Results of work and draft report (25 marks)

Components – III (C3) : Final evaluation and viva-voce (150 marks). The dissertation report evaluation is for 100 marks and the Viva-voce examination is for 50 marks.

Total : 200 Marks

8. RANKING

Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking / Distinction. Provided in the case of candidates who pass all the examinations prescribed for the course with a break in the First Appearance due to the reasons as furnished in the Regulations under "Requirements for Proceeding to subsequent Semester" are only eligible for classification.

M.Sc. Clinical Nutrition and Dietetics Course
SEMESTER-I

Course Code & Title	22UPCND1C01- Human Physiology		
Class	**I M.Sc.**	**Semester**	**I**
Cognitive Level	**K-1, K-2, K-3 & K-4**		
Course Objectives	**The Course aims** • To give deeper knowledge in physiology, clinical physiology and teaching methodology in these subjects • To master the structure and functions of various systems. • To correlate the normal and diseased conditions. • To apply physiological testing techniques in the laboratory related to theory.		

Unit	Content	Number of Hours
I	**Physiology of Cell** a) General cell structure. b) Structure and functions of the organelles, c) Cell membrane. d) Structure and function of Tissues and their characteristics e) Body Fluid Compartment, f) Membrane Potential g) Inter Cellular Communication – h) Structure, Function and role of Sensory Organs (skin, eyes, ears, nose and tongue) in perception of stimuli.	13
II	**Basic principles of Cell injury and Adaptation:** a) Introduction, definitions, Homeostasis, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), b) Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), c) Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis &Alkalosis **Immunity:** a) Properties, Natural and acquired Immunity and Feature of immune responses b) Antigen - antibodies c) Types, Properties and Antigen - antibody interaction	17
III	**Endocrinology and Reproduction** a) Functions of endocrine glands b) Mechanism of hormonal action. Control of hormonal secretion. c) Function and different syndromes resulting from hypo and hyper secretion of Endocrine gland mainly Pituitary, Adrenal, Thyroid, Ovary, Testes, Pancreas, Parathyroid d) Structure and functions of male and female reproduction. e) Menstrual Cycle. Pregnancy, Parturition, Menopause, Mammary glands and location.	15

IV	**Cardiovascular system** a) Structure and function of Heart, Blood vessels b) Blood – Characteristics, Composition, c) Structure, function and life span of components. d) Blood clotting. Blood groups. Homeostatic. Erythropoiesis, e) Blood Pressure **Excretory System –** a) Structure and function of nephron. b) Anatomy and function of kidney. c) Urine formation. d) Electrolyte and acid base balance.	18
V	**Respiratory System** a) Physiology of respiration, b) Exchange of gases and transport through blood, c) Role of hemoglobin and buffer system. **Digestive system**: a) Review of structure of gastrointestinal tract and accessory organs. Role of Liver, Pancreas and gall bladder and their dysfunction. b) Hormones of GIT. c) Mechanism of absorption of carbohydrates, Proteins and fats d) Role of enzymes in digestion	12
	Total Hours	**75**

Relevant practical experiments includes

1. Slides identification.
2. Blood clotting and bleeding time.
3. Blood group identification.

Text books and Reference materials

1. Ganong, W.F. (1986): Review of Medical Physiology, 12th Edition, Lange Medical Publication.
2. Guyton, A.G. and Hall, J.B. (1996): Text Book of Medical Physiology, 9th Edition, W.B. Sanders Company, Prism Books (Pvt.) Ltd., Bangalore.
3. Wilson, K.J.W and Waugh, A. (1996): Ross and Wilson Anatomy and Physiology in Heath and Illness 8th Edition, Churchill Livingstone.
4. Jain, A.K.: Textbook of Physiology. Vol.I and II. Avichal Publishing Co., New Delhi
5. McArdle, W.D., Katch, F.I. and Katch V.L(1996): Exercise Physiology. Energy, Nutrition and Human Performance, 4th Edition, Williams and Wilkins, Baltimore.
6. Datta, Chandrani Sanyal (2006): Essentials of human physiology: AITBS.
7. Marieb, Elaine N. (2004): Pearson Human anatomy & physiology, 6th ed.
8. G K Pal - Textbook of Physiology, Vol 1& 2, Jaypee Brothers Medical Publishers

Web Resources:

- http://physiology.forumshealth.com/
- *https://www.pdfdrive.com/physiology-books.html*

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Outline the structure and functions of human organs. **CO2:** Discuss the Cellular functions and explain its importance in healthy life. **CO3:** Describe organ systems and its functions effectively and co-relate the role offood and nutrition in organ functioning. **CO4:** Explain and analyze the functions of hormones and their implications in disease conditions.

COs Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	N	N	M	S	M	S	S
CO2	S	S	S	S	N	N	M	S	L	S	M
CO3	S	S	S	S	N	N	M	S	M	S	M
CO4	S	S	S	S	N	N	M	S	S	S	M

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	10	10	20	20
Understand	10	10	15	15
Apply	20	20	25	25
Analyse	10	10	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1C02- Applied Food Science**		
Class	**I M.Sc.**	**Semester**	**I**
Cognitive Level	**K-1, K-2, K-3, K-4 & K-5**		
Course Objectives	**The Course aims** • To assist the students to apprehend the composition, classification and function of various food groups. • To analyse the factors affecting cooking and keeping quality of food. • To impart the scientific knowledge of food principles required to become successful food scientists and nutritionist who can work in industry, government or academia or as entrepreneurs.		

Unit	Content	Number of Hours
I	**Cereals** Types, Structure of cereal grains, composition, processing (germination and fermentation), storage and storage and its processed products of some common cereals (Rice, Wheat, Maize,Oats) **Millets** Types, Composition, Nutritive value, Value added products - Processing methods and its processed products (Finger millet,Foxtail millet, Sorghum, Pearl millet) **Pluses:** Types , Composition, Nutritive value, Processing (germination and fermentation), Storage and its processed products of some common pulses (Bengal gram, Black gram, Horse gram, Green gram)	18

II	**Milk and Milk Products:** a) Composition, Nutritive value, Physical and functional properties. b) Types of Milk – Whole milk, Low fat milk, Toned milk, Double toned milk, Fortified milk, Flavored milk, Spray dried milk c) Processing of Milk - Milk powders, Ghee, Khoa,Butter, Paneer, Cheese, Yoghurt, Curds, Lassi, Shrikhand, Buttermilk and Ice creams. **Flesh foods** a) Types, Composition and structure of muscle b) Ripening of meat and Tenderizing of meat c) Cooking and processing. **Marine foods (Fish and Seaweeds)** a) Types and Composition b) Criteria for Fish and Seaweed selection c) Fish and Seaweed products	15
III	**Eggs:** a) Quality grading, Structure, Composition and Changes during storage b) Functional properties of Eggs, Uses in cookery c) Egg processing d) Low cholesterol Egg substitutes in health system. **Fruits and Vegetables:** a) Structure, Composition and Nutritive value of Fruits and Vegetables b) Fruit products: Fermented and Non fermented; c) Effect of Cooking on Colour and Texture of Vegetables. d) Effect of processing on Nutritive value and Physiochemical properties of Fruits; e) Browning reactions: Types and Mechanism; Prevention methods	15
IV	**Fats & Oils:** a) Composition of Food Fats b) Modification of fats: Hydrogenation- Cis and Trans Isomers, Interesterification, Acetylation, Winterization; Hydrolytic Rancidity & Oxidative Rancidity; Radiolysis Shortening Power of Fats, Tenderization, Emulsification, Frying - Smoke Point, Auto Oxidation, Properties of Fats and Oils c) Uses of fat replacers in processed foods. **Sugar and Jaggery** a) Principles of Sugar Crystallization, b) Stages of cookery and role in Indian Traditional Sweet preparations c) Manufacturing of Candies and Sweets d) Artificial Sweeteners – list, Structure, Taste Profile, Permitted list, Usage levels and Food applications**.**	15
V	**Sensory evaluation of foods** a) Sensory characteristics of foods b) Types of Sensory test, Sensitivity test and Objective evaluation. **Food additives:** a) Definition, Need and Classification of Food Additives, Preservatives-Natural and Artificial, Antioxidants, Chelating agents, Coloring agents, Curing agents, Emulsions, Flavors and Flavor enhancers, Leavening agents, Nutritional Supplements, Non-Nutritive Sweeteners b) Humectants, pH control agents, Stabilizer and Thickeners, Anti-caking agents, Firming agent, Clarifying Agent, Flour Bleaching agents. **Packaging** a) Importance, Functions & Types of Packaging material.	12
	Total Hours	**75**

References

Text Books:

- Antia F.P. And Philip Abraham-Clinical Nutrition and Dietetics, 2001, Oxford Publishing Company.
- Swaminathan S- Advanced Textbook On Food & Nutrition, 2015, Bappco
- B. Srilakshmi- Dietetics, 2019, 8thEdn, New Age International Pvt. Ltd. New Delhi.

Reference Books:

- Mahan L.K., Sylvia Escott-Stump - Krause's Food Nutrition and Diet Therapy 10th Edition, 2001,W.B. Saunders Company London.
- Passmore P. And M.A. East Wood - Human Nutrition and Dietetics, Churchill Living Stone.
- Raheena M. Begum - A Text Book of Foods Nutrition and Dietetics ¸ 3 edition 2009,Sterling Publishers Pvt. Ltd
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick : Normal And Therapeutic Nutrition,17 thEdn, Macmillan Publishing Company.
- Shills and Young- Modern Nutrition In Health And Disease,2012, Lippincott Williams and Wilkins.
- Bennion M.: Clinical Nutrition, John Wiley & Sons.
- Whitney, E. N. and C. B.Cataldo, Understanding Normal and Clinical Nutrition, 1983, West Pub.
- Branen AL, Davidson PM &Salminen . 2001 Food additives 2nd Ed.Marcel Dekker
- George AB.1996.Encyclopedia of food colour and additives Vol.III CRC Press
- Lal G, Siddapa GS &Tandon GL.1986. Preservation of Fruits and Vegetables. ICAR
- Williams S. R.Essentials of Nutrition and DietTherapy**,** 4th edn, 1986, Mosby College Pub. S. Louis.

Web Resources:

- www.anme.com.mx/libros/PrinciplesofNutrition.pdf
- https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf
- krishikosh.egranth.ac.in

Course Outcomes	**On completion of the course, students should be able to** **CO1**: Cite and explain the chemistry, structure and composition underlying the properties of various food components. **CO2:** Ascertain the major chemical reactions that occur during food preparation and storage. **CO3:** Apply food science knowledge to describe functions of ingredients infood. **CO4:** Plan appropriate sensory evaluation tests to answer specific questions regarding food attributes or consumer preferences. **CO5:** Describe techniques that can be used to monitor quality of raw ingredients and final packaged products.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**						**PSO**				
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	L	L	M	L	S	S	L	L
CO2	S	S	S	S	M	L	M	S	S	M	L
CO3	S	S	S	S	N	M	M	S	S	S	M
CO4	S	S	S	M	L	S	S	S	S	S	L
CO5	S	S	S	S	M	S	N	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	5	10	20	20
Understand	15	10	15	15
Apply	10	15	15	15
Analyse	10	10	15	15
Evaluate	10	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1C03 -Human Development and Nutrition**		
Class	**I M.Sc.**	**Semester**	**I**
Cognitive Level	**K-1, K-2, K-3, & K-4**		
Course Objectives	**The Course aims** • To know the importance of nutrition during life span and also to enlighten on the RDA and dietary modifications for different age groups. • Develop aptitude to learn the stages of growth and development of different age groups • To familiarize the theories of growth and development of all ages.		

Unit	Content	Number of Hours
I	**Recommended Allowances** a) RDA for Indians, Estimated Average Requirements, Computation of Allowance based on Energy Expenditure, Components of Energy Expenditure. **Nutrition in Pregnancy:** a) Physiology of Pregnancy b) Stages of Gestation, Maternal Weight Gain c) Nutritional requirements and dietary guidelines during Pregnancy d) High risk Pregnancies and Complications during Pregnancy e) Role of Exercise & Fitness during Pregnancy	15
II	**Nutrition during Lactation** a) Breast feeding biology, Psycho - physiological aspects of Lactation, Factors affecting Lactation Capacity. b) Nutritional requirements & Dietary Guidelines c) Galactogogues d) Lactation Management in Normal & Special conditions e) Effect of Breast Feeding on Maternal Health **Nutrition in Infancy** a) Growth and Development and Nutrient Needs b) Infant feeding, Volume and Composition of Breast Milk, Human Milk Vs. Artificial Formula. c) Weaning Foods and Feeding Problems d) Common Nutrition Problems e) Preterm and LBW infants: Consequences, Implications for Feeding and Management.	18
III	**Nutrition in Childhood** a) Growth and Development – Stage, Theories – Maturationist theory, Behaviorist theory, Eriksons psycho analytical theory, Piagets cognitive theory, Vygotsky's theory.	13

	b) Nutritional requirements for Preschool and School Children c) Micronutrient Malnutrition among Preschool Children d) Nutrition for Special Children- Autism e) Feeding Problems f) Healthy food choices during Childhood g) Factors to be considered for planning a School Lunch	
IV	**Adolescence** a) Growth and Development – Stages, Theories – Freud's psychosexual stage theory, Kohlberg's moral understanding stage theory, and Bronfenbrenner's ecological theory. b) Physiological and Psychological changes c) Nutritional requirements of Adolescents d) Nutritional issues and eating disorders in Adolescence **Adulthood** a) Theories of Adult Development: Levinson, Vaillant& Neugarten b) Physiological and Psychosocial changes c) Common Nutritional Concerns and Diet d) Nutritional requirements for Adult Man and Woman e) Physical Activity in Adulthood	14
V	**Elderly** a) Theories of Aging – - Theory Building in Aging- Historical Development of Theories of Aging, Models and Explanation, Theory Development and Research Design in Aging. - Biological Theories of Aging - Biological Theories of Senescence, Stress Theories of Aging. - Psychological Theories of Aging- Theories of Cognition, Theories of Everyday Competence, Social-Psychological Theories. - Sociological Theories of Aging - Anthropological Theories, Life Course Theories, Social Theories of Aging. b) Nutritional requirements of the Elderly c) Effects of Aging on organ functions and Nutritional Health of Elderly	15
	Total Hours	**75**

References

Text Books:

- Brown, J. E-Nutrition through the Life Cycle, 6 edn, 2016, Cengage Learning.
- Mahan L. K. & Stump S.E Krause's - Food Nutrition and diet Therapy, 11edn, 2003, Saunders.
- B.Srilakshmi - Nutrition Science, 2006, New Age International.

Reference Books:

- Groff, J. L and Gropper, S. S- Advanced Nutrition and Human Metabolism, Belmount CA: Wads worth/Thomson Learning.
- Goodhart, R. S. S. and Shils, M. E - Modern Nutrition in Health and Disease, Philadelphia: Lea and Febiger.
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick : Normal And Therapeutic Nutrition,17th Edn, Macmillan Publishing Company.
- Krause's., Kathleen Mahan., Marian T. Arlin: Food Nutrition & Diet Therapy, 8th Edition 1992, W.B. Saunders Company.
- Jackson, M. S - Adolescent Nutritional Disorders, 1997, The New York Academy of Science.
- Jellife D.B- Assessment of Nutrition Status of the Community, 1966, WHO, Geneva.

Web Resources:

- https://www.universalclass.com/articles/health/nutrition/nutritional-needs-for-different-ages.
- https://www.nutrition.org.uk/nutritionscience/life.html.
- http://www.open.edu/openlearncreate/mod/oucontent/view.php.

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Define the nutritional needs of each age group. **CO2:** Infer the appropriate theories to distinguish the developmental milestones. **CO3:** Co-relate the physiological and psychological changes adhering to all age groups. **CO4:** Interpret the nutritional problems pertaining to different ages.

COs Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	M	M	S	S	S	S	S
CO3	S	S	S	S	L	L	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	10	10	20	20
Understand	10	10	20	20
Apply	15	15	15	15
Analyse	15	15	20	20
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	22UPCND1C04- Clinical Nutrition and Dietetics-I		
Class	**I M.Sc.**	**Semester**	**I**
Cognitive Level	**K-1, K-2, K-3, K-4& K-5**		
Course Objectives	**The Course aims** • To facilitate the students to realize the principles of diet. • To expertise in the dietary modifications for different diseases. • To develop the proficiency of becoming successful clinical dieticians.		

Unit	Content	Number of Hours
I	**Clinical Nutrition and Dietetics** a) Definition and History of Dietetics. b) Dietitian as part of the Medical Team c) Nutritional Screening and Care - Nutritional Assessment - Diagnosis - Intervention and Evaluation. **Diet, Nutrient and Drug Interaction** a) Effect of drugs on ingestion, Digestion, Absorption and Metabolism of Nutrients. **Diet Modifications**	15

	a) Normal diet as a basis for Therapeutic Diets b) Routine Hospital Diet c) Feeding Methods - Enteral Nutrition-Site, Different tube sizes, Different types of feeds, Composition and Delivery methods and its complications. - Parenteral Nutrition- Type of access, Parenteral nutrition solutions/composition, Administration methods, Monitoring & Complications.	
II	**Dietary Management in Deficiency Diseases** a) Aetiology, Symptom and Diagnostic tests and Dietary treatment for PEM, Vitamin A and Anaemia **Dietary Management in Febrile Condition** a) Classification and Etiology of fever/infection, Symptoms, Diagnostic tests , Metabolic changes during infection and Dietary treatment for - Typhoid, Influenza, Malaria, Tuberculosis and AIDS **Diet for Weakened Immune System**- Neutropenic diet, COVID and Dengue **Dietary Management in Allergy** a) Definition, Symptoms and Diagnostic tests b) Common food allergens and Mechanism of food allergy c) Elimination diets d) Prevention of food allergy.	15
III	**Dietary Management in Surgery** a) Nutrition in wound healing b) Stage of Convalescence c) Dietary management for pre and post- surgical diets. **Dietary Management in Burns** a) Classification and Complications b) Metabolic changes in protein and electrolytes c) Dietary management & mode of nutrition support for burns and wound management of burns. **Dietary Management in Trauma** a) Physiological, metabolic and hormonal response to injury b) Dietary management in trauma **Dietary Management in Sepsis** a) Definition and Dietary management of Sepsis with or without Multiple Organ Dysfunction Syndrome (MODS)	15
IV	**Nutrition for Weight Management: Disorders of Energy Balance** **Obesity** a) Components of body weight b) Regulation of body weight c) Obesity: causes, types, assessment and health risks d) Management of obesity - Dietary Modification, past and present approach - Psychology of weight reduction: psychotherapy and behaviour modification Physical activity and exercise - Pharmacological treatment - Surgical treatment effect on satiety and other factors - Maintenance of Reduced weight **Underweight** a) Pathophysiology b) Causes, assessment, health risks and effect on nutritional status c) Dietary Management, Psychotherapy	15

V	**Dietary Management in Musculoskeletal Disorders** **Gout** a) Aetiology, Role of proteins and purines, clinical features and complications, Management of gout **Osteoporosis and Osteomalacia** a) Prevalence, Types and Etiology and Role of Calcium, Phosphate & Vitamin D in Osteoporosis and Osteomalacia. b) Measurement of Bone Mass Using Bone Mineral Density (BMD) and Peak Bone Mass (PBM). **Arthritis- Rheumatoid and Osteo arthritis** **a)** Aetiology and dietary management	15
	Total Hours	**75**

References

Text Books:

- Antia F.P. And Philip Abraham- Clinical Nutrition and Dietetics, 2001, Oxford Publishing Company.
- Swaminathan S- Advanced Textbook On Food&Nutrition, 2015, Bappco
- B.Srilakshmi- Dietetics, 2019, 8thEdn, New Age International Pvt.Ltd. New Delhi.

Reference Books:

- Mahan L.K., Sylvia Escott-Stump - Krause's Food Nutrition and Diet Therapy 10th Edition, 2001,W.B. Saunders Company London.
- Passmore P. And M.A. EastWood- Human Nutrition and Dietetics, Churchill Living Stone.
- Raheena M. Begum - A Text Book of Foods Nutrition and Dietetics ¸ 3 edition 2009, Sterling Publishers Pvt. Ltd
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick: Normal And Therapeutic Nutrition,17th Edn, Macmillan Publishing Company.
- Krause's., Kathleen Mahan., Marian T. Arlin: Food Nutrition & Diet Therapy, 8th Edition 1992, W.B. Saunders Company.
- Shills and Young Modern Nutrition In Health And Disease, 2012, Lippincott Williams and Wilkins.
- Bennion M.: Clinical Nutrition, John Wiley& Sons.
- Whitney, E. N. and C. B.Cataldo, Understanding Normal and Clinical Nutrition, 1983, WestPub.
- Williams S.R. Essentials of Nutrition and Diet Therapy**,** 4th edn, 1986, Mosby College Pub. S.Louis.

Web Resources:

- www.anme.com.mx/libros/PrincipiesofNutrition.pdf
- https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf
- krishikosh.egranth.ac.in

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Elucidate the importance of interdisciplinary approaches to the management of nutritional problems and the promotion of nutritional health and well -being. **CO2:** Assess the nutritional status of critically ill patients **CO3:** Determine the dietary essentials for recovery and maintenance of various systems. **CO4:** Describe the etiology, symptoms and dietary management of deficiency diseases and febrile conditions. **CO5:** Explain, analyze, diagnose and causes of allergy.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	L	S	M	S	S	S	S
CO2	S	S	S	S	L	S	M	S	S	S	S
CO3	S	S	S	S	L	S	M	S	S	S	S

CO4	S	S	S	S	L	S	M	S	S	S	S
CO5	S	S	S	S	L	S	M	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests(Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	10	5	20	20
Understand	10	15	20	20
Apply	20	15	15	15
Analyse	5	10	10	10
Evaluate	5	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1CP01–Computer Applications in Human Development and Nutrition Practical**		
Class	**I M.Sc.**	**Semester**	**I**
Cognitive Level	**K-1, K-2, K-3, K-4, K-5 &K-6**		
Course Objectives	**The Course aims** • To enable the students to develop menu for each age group, which meet nutritional requirements needs. • To expertise in dietary modification required for different age group.		

S.No	**Exercises**	**Number of Hours**
1.	Development of a Ready – Reckoner for calculating nutrient content of various foods, portion size and volume, conversion of cooked to raw equivalent of various foods	4
2.	Learning how to use different nutritional assessment tools -MNA, MUST etc	4
3.	Menu planning for Pregnancy	4
4.	Menu planning for Lactation	4
5.	Menu planning for Infants	5
6.	Menu planning for Pre-School Children	5
7.	Menu planning for School Going Children- Meals and Packed Lunch	5
8.	Menu planning for Adolescence	5
9	Menu planning for adult with different working category- Sedentary, Moderate and Heavy Worker	4
10	Menu planning for Elderly people	5
	Total Hours	**45**

References

Text Books:

- Brown, J. E-Nutrition through the Life Cycle, 6 edn., 2016, Cengage Learning.
- Mahan L. K. & Stump S.E Krause's - Food Nutrition and diet Therapy, 11edn, 2003, Saunders.
- B.Srilakshmi- Nutrition Science, 2006, New Age International.

Reference Books:

- Groff, J. L and Gropper, S. S- Advanced Nutrition and Human Metabolism, Belmount CA: Wads worth/Thomson Learning.
- Goodhart, R. S. S. and Shils, M. E - Modern Nutrition in Health and Disease, Philadelphia: Lea and

Febiger.
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick: Normal And Therapeutic Nutrition, 17th Edn, Macmillan Publishing Company.
- Krause's., Kathleen Mahan., Marian T. Arlin: Food Nutrition & Diet Therapy, 8th Edition 1992, W.B. Saunders Company.
- Jackson, M. S - Adolescent Nutritional Disorders, 1997, The New York Academy of Science.
- Jellife D.B- Assessment of Nutrition Status of the Community, 1966, WHO, Geneva.

Web Resources:
- https://www.universalclass.com/articles/health/nutrition/nutritional-needs-for-different-ages.
- https://www.nutrition.org.uk/nutritionscience/life.html
- http://www.open.edu/openlearncreate/mod/oucontent/view.php

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Develop a ready –reckoner for calculating nutrient content of various foods in normal persons and the ability to modify for given disease conditions. **CO2:** Infer the appropriate principles in diet planning for developmental milestones. **CO3:** Co-relate the physiological and psychological needs while designing menu. **CO4:** Interpret and discuss the nutritional values of developed menu with RDA using software.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	M	M	S	S	S	S	S
CO3	S	S	S	S	L	L	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	5	5	5	5
Understand	5	5	5	5
Apply	5	10	10	10
Analyse	15	10	10	10
Evaluate	15	15	15	15
Create	15	15	15	15
Total	**60**	**60**	**60**	**60**

Course Code & Title	**22UPCND1CP02- Computer Applications in Clinical Nutrition and Dietetics-I Practical**		
Class	**I M.Sc.**	**Semester**	**II**
Cognitive Level	**K-3, K-4, K-5 & K-6**		
Course Objectives	**The Course aims** • To provide training in the planning and preparation of therapeutic diets using software. • Expertise in various feeding formulas and techniques.		

Unit	Content	Number of Hours
1.	Menu planning and software computation of Nutrients for Diet Therapy: Clear fluid diet, Full fluid diet and Soft diet	5
2.	Preparation and laboratory trail of formulas for Enteral Feeding- Home based and commercial supplement feeds.	3
3.	Menu planning and software computation of Nutrients for Anaemia, Vitamin-A Deficiency and PEM	5
4.	Menu planning and software computation of Nutrients for Typhoid, Malaria, Tuberculosis, AIDS	6
5.	Menu planning and software computation of Nutrients for Weakened Immune System- Neutropenic diet, COVID, Dengue	5
6.	Menu planning and software computation of Nutrients for Pre & Post surgery patients and software computation of nutrients	5
7.	Menu planning and software computation of Nutrients for Post Burn Condition	5
8.	Menu planning and software computation of Nutrients- Obesity and Underweight individuals.	5
9.	Menu planning and software computation of Nutrients for Gout patient.	3
10.	Menu planning and software computation of Nutrients for Osteoporosis	3
	Total hours	**45**

References

Text Books:

- Antia F.P. And Philip Abraham-Clinical Nutrition and Dietetics, 2001, Oxford Publishing Company.
- Swaminathan S- Advanced Textbook On Food & Nutrition, 2015, Bappco
- B. Srilakshmi- Dietetics, 2019, 8thEdn, New Age International Pvt. Ltd. New Delhi.

Reference Books:

- Mahan L.K., Sylvia Escott-Stump - Krause's Food Nutrition and Diet Therapy 10th Edition, 2001,W.B. Saunders Company London.
- Passmore P. And M.A. East Wood - Human Nutrition and Dietetics, Churchill Living Stone.
- Raheena M. Begum - A Text Book of Foods Nutrition and Dietetics ¸ 3 edition 2009,Sterling Publishers Pvt. Ltd
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick: Normal And Therapeutic Nutrition, 17thEdn, Macmillan Publishing Company.
- Krause's., Kathleen Mahan., Marian T. Arlin: Food Nutrition & Diet Therapy, 8th Edition 1992, W.B. Saunders Company.
- Shills and Young- Modern Nutrition In Health And Disease, 2012, Lippincott Williams and Wilkins.
- Bennion M.: Clinical Nutrition, John Wiley & Sons.
- Whitney, E. N. and C. B.Cataldo, Understanding Normal and Clinical Nutrition, 1983, West Pub.
- Williams S. R. Essentials of Nutrition and Diet Therapy**,** 4th edn, 1986, Mosby College Pub. S. Louis.

Web Resources:

- www.anme.com.mx/libros/PrinciplesofNutrition.pdf
- *https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf*
- *krishikosh.egranth.ac.in*

Course Outcomes	On completion of the course, students should be able to **CO1:** Assess the nutritional status using various nutritional assessment tools. **CO2:** Develop a ready –reckoner for calculating nutrient content of various foods in normal persons and the ability to modify for given disease conditions. **CO3:** Apply the principles of diet and determine the dietary essentials for recovery from critical illness. **CO4:** Plan menu for the given disease condition and compare and contrast with R.D.A using software.

COs Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	-	-	-	-
Understand	-	-	-	-
Apply	15	10	10	10
Analyse	15	15	10	10
Evaluate	15	15	15	15
Create	15	20	25	25
Total	**60**	**60**	**60**	**60**

M.Sc. Clinical Nutrition and Dietetics Course
SEMESTER-II

Course Code & Title	22UPCND1C05- Clinical Biochemistry		
Class	**I M.Sc.**	**Semester**	**II**
Cognitive Level	**K-1, K-2, K-3, K-4, K-5**		
Course Objectives	**The Course aims** • To enable the students to understand the various mechanism adopted by the human body for the regulation of metabolic cycles. • To learn the interrelationship between various metabolic pathways. • To skill the sources, functions and deficiency conditions of macro and micro nutrients.		

Unit	Content	Number of Hours
I	**Body fluids, Hormones, Enzymes and Components of blood and its relevantdiseases** a) Composition and function of blood b) Plasma and blood corpuscles c) Structure and function of haemoglobin, abnormal haemoglobins. d) Disorders of haemoglobin e) Mechanism of blood clotting - intrinsic and extrinsic pathway	18

	f) Disturbances in blood clotting mechanisms – haemorrhagic disorders – haemophilia, von Willebrand's disease, purpura, Rendu-Osler-Werber disease, thrombotic thrombocytopenic purpura, disseminated intravascular coagulation, acquired prothrombin complex disorders, circulating anticoagulants. **Hormones and Enzymes** a) Mechanism of hormone action and its regulation. b) Enzymes in health and diseases. Enzymes in differential diagnosis of diseases and their clinical significance. **Bioenergetics** a) Electron transport chain, Oxidative phosphorylation and Synthesis of ATP	
II	**Carbohydrates** a) Occurrence, Classification and Structure, Physic-chemical properties, Isomerism and biological importance of carbohydrates. b) Monosaccharide and related compounds, disaccharides and Polysaccharides. **Metabolism of carbohydrates** a) Aerobic and anaerobic degradation b) Glycogenesis and Glycogenolysis c) Glycolysis and Gluconeogenesis d) Cori's cycle, Pyruvate Dehydrogenase complex e) Krebs-cycle and Pentose phosphate pathway f) Regulation of Carbohydrate Metabolism. g) Diabetes mellitus, Glucose and Galactose Tolerance Tests, Sugar Levels in Blood, Renal Threshold for Glucose, Factors Influencing Blood Glucose Level, Pentosuria, Galactosemia and Glycogen Storage Diseases.	18
III	**Proteins** a) Classification, Structure and Properties of Amino acidsand Proteins b) Assessment of Protein Quality **Metabolism of Proteins** a) Amino acids – Types, Therapeutic application of specific amino acids b) Inborn errors of protein metabolism - Phenylketonuria, alkaptonuria, albinism, tyrosinosis, maple syrup urine disease, Lesch-Nyhan syndrome, sickle cell anemia, Histidinemia. c) Metabolism of amino acids - Decarboxylation, Transamination, Deamination, Glycine, Tyrosine,Tryptophan, Methionine and Urea cycle. d) Nucleic acids- Biosynthesis and Degradation of Purines and Pyrimidine's and their regulation.	18
IV	**Lipids** a) Structure and Biological importance and Distribution of fatsand fatty acids. b) Chemical Properties and Characterization of fats. **Metabolism of Lipids** a) Biosynthesis of saturated and unsaturated fatty acids b) β-Oxidation of fatty acid c) Biosynthesis of Glycerides, Phospholipids and Cholesterol. d) Regulation of lipid metabolism and Ketone bodies. e) Disorders of lipid Metabolism, Lipoproteins and their significance.-, Hyperlipidemia, Hyperlipoproteinemia, Gaucher's disease, Tay-Sach's and Niemann-Pick disease, Ketone bodies, Abetalipoproteinemia.	18

V	**Vitamins** Dietary sources, biochemical functions, requirements and deficiency diseases of following vitamins a) Fat soluble Vitamins: A, D, E, & K b) Water Soluble vitamins: Thiamine, Riboflavin, Niacin, Ascorbic Acid, Folic Acid, Biotin, Pyridoxine, Pantothenic Acid, Cyanocobalamin, Choline and Inositol **Macro minerals** Dietary sources, Biochemical Functions, Requirements And Deficiency Diseases of following macro minerals a) Phosphorus, Calcium, Magnesium, Sodium, Potassium and Chloride. **Micro minerals** Dietary sources, biochemical functions, requirements and deficiency diseases of following macro minerals a) Iron, Copper, Iodine, Fluoride, Zinc and Manganese.	18
	Total Hours	**90**

References

Text Books:

- AmbikaShanmugam- Fundamentals of Biochemistry for Medical Students, 8 th edition, 2016, Wolters Kluwer India Pvt. Ltd
- Lehingeretal. – Principles of Biochemistry, 7th ed. 2017 WH Freeman.
- Satyanarayana.U –Essentials of Biochemistry, 2nd edn, 2008, Books And Allied (p) Ltd
- Devlin: Textbook of Biochemistry with clinical correlation, 7thEdn, 2010, John Wiley and Sons Publishers.

Reference Books:

- Devin. T.M- Text book of Biochemistry with Clinical Correlations, 1997, 4th Ed., WileyLiss Inc.
- Voet and Prat- Fundamentals of Biochemistry , 8 thEdn, 2004, John Wiley & Sons
- Conn, stumpt. et .al. Outlines of Biochemistry, 2001, 5th Ed John Wiley and Sons.
- Murray et. al. – Harpers Illustrated Biochemistry, 2000, 25thEdn, Macmillan Worth Publishers.
- Henry. R. D: Clinical Chemistry- Principles and Techniques (Harfer and Row)

Web Resources:

- www.virutal library biochemistry
- http:// themedicalbiochemistrypage.org

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Summarize the basic concepts of biochemistry. **CO2:** Explain the metabolism of macro and micro nutrients. **CO3:** Describe the mechanism of body fluids **CO4:** Determine the inborn errors of metabolism. **CO5:** Discuss the bioavailability, excess and deficiency conditionsof all nutrients.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	M	L	M	M	M	M	M	M
CO2	S	S	S	M	L	L	M	M	L	S	L
CO3	S	S	S	S	L	L	M	S	L	S	L

CO4	S	S	S	S	L	L	S	S	M	M	L
CO5	S	S	S	S	L	M	S	S	S	S	M

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests(Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	10	10	20	20
Understand	10	15	25	25
Apply	15	10	10	10
Analyse	10	10	10	10
Evaluate	5	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1C06- Clinical Nutrition and Dietetics -II**		
Class	**I M.Sc.**	**Semester**	**II**
Cognitive Level	**K-1, K-2, K-3, K-4& K-5**		
Course Objectives	**The Course aims** • To apprehend the etiology, symptoms and complications of diseases. • To enable the students to recommend and provide appropriate nutritional care for prevention and treatment of the various diseases. • To gain efficacy in principles of diet therapy for metabolic and degenerative diseases.		

Unit	**Content**	**Number of Hours**
I	**Nutrition in Cardiovascular Diseases** **Blood Pressure**- Regulation, Short term (sympathetic nervous system) and long-term (kidneys) **Hypertension** a) Definition, Classification and Causes b) Signs & Symptoms and Complications c) Dietary management - Diet related factors influencing hypertension, DASH diet -Lifestyle modification **Cardio Vascular Diseases** a) Prevalence, Etiology and Risk Factors b) Clinical diagnostic tests and dietary management for - Hyperlipidemia and Hyperlipoproteinemia, Atherosclerosis, Angina Pectoris and Myocardial Infarction (MI), Congestive Cardiac Failure (CCF) and Cardiac Cachexia **c)** Prevention through life style modifications	15
II	**Dietary Management of Upper Gastro Intestinal Diseases** a) Etiology, signs & symptoms, diagnostic test and complications b) Dietary managementfor - Gastritis, Peptic ulcer, Dyspepsia, Esophagitis and Dumping Syndrome. **Dietary Management of Lower Gastro Intestinal Diseases**	

	a) Etiology, signs & symptoms, diagnostic test and complications b) Dietary management for - Flatulence, Diarrhea, Dysentery, Constipation, Celiac disease, Steatorrhea, Tropical sprue, Irritable bowel syndrome, diverticular disease, colon cancer, Ulcerative colitis and Crohn's Disease.	15
III	**Dietary Management of Hepato-Biliary Tract Diseases** **Liver Disease** a) Types, Etiology, Symptoms and Complications b) Functions of the liver and liver function tests c) Metabolic consequences of alcohol consumption d) Dietary management for - Hepatitis, Cirrhosis and Hepatic coma. **Gall Bladder Diseases** a) Functions of Gall Bladder b) Gall bladder function tests c) Dietary management for - Cholecystitis, Cholelithiasis, Acute Cholangitis and Cholestasis **Pancreatic Disorders** a) Functions of Exocrine Pancreas b) Pancreatic function tests c) Dietary management for - Pancreatitis (Acute and chronic) and Zollinger- Ellison Syndrome	15
IV	**Dietary Management of Diabetes Mellitus** a) Prevalence, Types, Aetiology and Signs and Symptoms b) Factors affecting normal blood glucose levels c) Diagnostic test for Diabetes d) Complications of Diabetes - Macro-vascular and Micro-vascular **Management of Diabetes** a) Food exchange list b) Glycaemic index of foods, Carbohydrate counting and Resistant starch c) Sweeteners and sugar substitutes d) Meal planning approaches - With and without Insulin and during sickness. e) Medications - Oral hypoglycaemic drugs and Insulin. f) Lifestyle modification and exercise to manage Diabetes Mellitus. **Management of Hypoglycaemia** a) Types, symptoms and fasting state hypoglycemia b) Dietary treatment **Dietary Management of Cancer** a) Types, Etiology and Signs and symptoms, and diagnosis of Cancers. b) Cancer therapy and its complications - Chemotherapy, Radiation therapy and Surgery. c) Dietary management to Cancer patient, Recent developments in Nutrition and Cancer.	15
V	**Dietary Management of Renal Diseases** a) Aetiology, Clinical signs & Symptoms b) Functions of kidney c) Kidney function tests. d) Types of Kidney Diseases - Glomerulonephritis, Nephrotic Syndrome**,** Acute Renal Failure (ARF), Chronic Renal Failure (CRF), End Stage Renal Disease (ESRD)- Dialysis and Kidney	15

	Transplant. e) Dietary Management and Use of sodium, potassium and phosphorus exchange lists in diet planning of kidney diseases patient. **Nephrolithiasis/Renal Calculi** a) Aetiology b) Types of stones and nutritional care- acid and alkaline ash diet.	
	Total Hours	**75**

References

Text Books:

- Antia F.P. And Philip Abraham-Clinical Nutrition and Dietetics, 2001, Oxford Publishing Company.
- Swaminathan S- Advanced Textbook On Food & Nutrition, 2015, Bappco
- B. Srilakshmi- Dietetics, 2019, 8thEdn, New Age International Pvt. Ltd. New Delhi.

Reference Books:

- Mahan L.K., Sylvia Escott-Stump - Krause's Food Nutrition and Diet Therapy 10th Edition, 2001,W.B. Saunders Company London.
- Passmore P. And M.A. East Wood - Human Nutrition and Dietetics, Churchill Living Stone.
- Raheena M. Begum - A Text Book of Foods Nutrition and Dietetics ¸ 3 edition 2009,Sterling Publishers Pvt. Ltd
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick: Normal And Therapeutic Nutrition, 17th Edn, Macmillan Publishing Company.
- Krause's., Kathleen Mahan., Marian T. Arlin: Food Nutrition & Diet Therapy, 8th Edition 1992, W.B. Saunders Company.
- Shills and Young- Modern Nutrition In Health And Disease, 2012, Lippincott Williams and Wilkins.
- Bennion M.: Clinical Nutrition, John Wiley & Sons.
- Whitney, E. N. and C. B.Cataldo, Understanding Normal and Clinical Nutrition, 1983, West Pub.
- Williams S. R. Essentials of Nutrition and Diet Therapy**,** 4th edn, 1986, Mosby College Pub. S. Louis.

Web Resources:

- www.anme.com.mx/libros/PrincipiesofNutrition.pdf
- *https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf*
- *krishikosh.egranth.ac.in*

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Elucidate the aetiology, signs and symptoms of diseases. **CO2:** Explain the different diseases affecting the organs. **CO3:** Describe the diagnostic test. **CO4:** Deliver nutritional management for metabolic and degenerative disease conditions. **CO5:** Determine the dietary essentials for recovery and maintenance of various diseases.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	L	M	M	S	S	S	S
CO2	S	S	S	S	L	L	M	S	S	S	S
CO3	S	S	S	S	S	L	M	S	S	S	S
CO4	S	S	S	S	S	M	S	S	S	S	S
CO5	S	S	S	S	S	L	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests(Marks)**	**Terminal Examination**

	I	II	III	(Marks)
Remember	5	10	20	20
Understand	10	5	20	20
Apply	15	15	15	15
Analyse	10	10	10	10
Evaluate	10	10	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1CP03-Clinical Biochemistry Practical**		
Class	**I M.Sc.**	**Semester**	**II**
Cognitive Level	**K-1, K-2, K-3, K-4& K-5**		
Course Objectives	**The Course aims** • To provide practical laboratory training in the estimation ofvarious nutritional parameters in blood and urine. • Acquire skills in using laboratory instruments.		

Unit	Content	Number of Hours
1.	Estimation of Blood Glucose	9
2.	Estimation of Total Protein	
3.	Estimation of Cholesterol in Blood	9
4.	Determination of Serum Creatinine	
5.	Estimation of Serum Iron	9
6.	Estimation of Serum Urea	
7.	Estimation of Calcium in Urine	9
8.	Estimation of Urea in Urine	
9.	Estimation of Creatinine in Urine	9
10.	Determination of PH in urine	
	Total Hours	**45**

References

Text Books:

- Varley, H. Gownakah and Hell-Practical clinical biochemistry, 1980, CBC Publishers, NewDelhi.
- Plummer, D.T - An Introduction to Practical Biochemistry, McGraw- Hill (UK)
- King, E.J. and Wootton, I.D.P - Micro-Analysis in Medical Biochemistry, J. & A. Churchill.

Reference Books:

- Raghuramulu, N. Nair, K, M, Kalyanasundaram-Manual of laboratory techniques, Second Edition 2003, ICMR.
- Jayaraman. J - Laboratory manual in Bio Chemistry,2011, New Age International Private Limited

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Compare and contrast the values of estimation with normal and diseased conditions. **CO2:** Apply the principles to estimate various parameters in blood. **CO3:** Apply the principles to estimate various parameters in urine.

COs Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4

CO1	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	L	S	M	M	L	L
CO3	S	S	S	S	S	L	S	M	M	L	L

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests(Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	15	10	10	10
Understand	15	10	15	15
Apply	10	15	10	10
Analyse	10	15	10	10
Evaluate	10	10	15	15
Create	-	-	-	-
Total	**60**	**60**	**60**	**60**

Course Code & Title	**22UPCND1CP04 - Computer Applications in Clinical Nutrition and Dietetics-II Practical**		
Class	**I M.Sc.**	**Semester**	**II**
Cognitive Level	**K-3, K-4, K-5&K-6**		
Course Objectives	**The Course aims** • To provide training in the planning and preparation of diets for different disease conditions using computers. • Expertise in various feeding formulas and techniques.		

Unit	**Content**	**Number of Hours**
1	Menu planning and software computation of Nutrients for Cardio vascular disease patients – Hypertension, Hypercholesterolemia, and Atherosclerosis.	8
2	Menu planning and software computation of Nutrients for Gastro Intestinal Disorders- Peptic Ulcer, Constipation, Diarrhoea, Lactose intolerance, Celiac Disease, IBS and IBD	10
3	Menu planning and software computation of Nutrients for the Liver and Pancreatic Disorders - Hepatitis, Cirrhosis, Hepatic Encephalopathy, Gall Stones and Pancreatitis.	9
4	Menu planning and software computation of Nutrients for the Individuals with Diabetes Mellitus - Type I Diabetes, Type II Diabetes and Gestational Diabetes.	8
5	Menu planning and software computation of Nutrients for Cancer patients.	
6	Menu planning and software computation of Nutrients for Renal Disorders- Glomerulonephritis, Nephrosis, Acute Renal Failure, Chronic Renal Failure, Dialysis and Renal Calculi	10
	Total Hours	**45**

References

Text Books:

- Antia F.P. And Philip Abraham-Clinical Nutrition and Dietetics, 2001, Oxford Publishing Company.
- Swaminathan S- Advanced Textbook On Food & Nutrition, 2015, Bappco
- B. Srilakshmi- Dietetics, 2019, 8thEdn, New Age International Pvt. Ltd. New Delhi.

Reference Books:

- Mahan L.K., Sylvia Escott-Stump - Krause's Food Nutrition and Diet Therapy 10th Edition, 2001,W.B. Saunders Company London.

- Passmore P. And M.A. East Wood - Human Nutrition and Dietetics, Churchill Living Stone.
- Raheena M. Begum - A Text Book of Foods Nutrition and Dietetics ¸ 3 edition 2009,Sterling Publishers Pvt. Ltd
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick: Normal And Therapeutic Nutrition, 17thEdn, Macmillan Publishing Company.
- Krause's., Kathleen Mahan., Marian T. Arlin: Food Nutrition & Diet Therapy, 8th Edition 1992, W.B. Saunders Company.
- Shills and Young- Modern Nutrition In Health And Disease, 2012, Lippincott Williams and Wilkins.
- Bennion M.: Clinical Nutrition, John Wiley & Sons.
- Whitney, E. N. and C. B.Cataldo, Understanding Normal and Clinical Nutrition, 1983, West Pub.
- Williams S. R. Essentials of Nutrition and Diet Therapy**,** 4th edn, 1986, Mosby College Pub. S. Louis.

Web Resources:

- www.anme.com.mx/libros/PrinciplesofNutrition.pdf
- *https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf*
- *krishikosh.egranth.ac.in*

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Apply the principles of diet and determine the dietary essentials for recovery from critical illness **CO2:** Apply the principles of diet and determine the dietary essentials for recovery from metabolic diseases. **CO3:** Plan and prepare menu for the given disease condition. **CO4:** Compare and contrast the derived nutritive values with R.D.A using software.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	-	-	-	-
Understand	-	-	-	-
Apply	15	10	10	10
Analyse	15	15	10	10
Evaluate	15	15	15	15
Create	15	20	25	25
Total	**60**	**60**	**60**	**60**

M.Sc. Clinical Nutrition and Dietetics Course
SEMESTER-III

Course Code & Title	22UPCND1C07 -Research Methods & Statistical Applications		
Class	II M.Sc.	Semester	III
Cognitive Level	K-1, K-2, K-3, &K-4		
Course Objectives	**The Course aims** • To provide sound knowledge on the fundamental principles and techniques of methodology concerning research in nutrition and dietetics. • To familiarize the type of research tools and techniques applicable to a research problem. • To acquaint with the statistical methods for testing of hypothesis.		

Unit	Content	Number of Hours
I	**Research Methodology** a) Meaning, Objectives and Significance in Research b) Forms of research- Basic, Applied, Action, Evaluation c) Scientific Methods- Meaning, Basis of scientific method, Requisites, The components of scientific approach. d) Criteria of good research e) Problems encountered by researchers in India **Research Process** a) Meaning, Selection of a research problem b) Steps involved in research process c) Formulating hypothesis and deciding variables d) Limitations and delimitations of a research problem e) Need for research in Clinical Nutrition and Dietetics, Ethics in research	15
II	**Research Design** a) Meaning, Need, Features, Concepts b) Types of Research Design – Case Study Design, Causal Design, Longitudinal Design, Cross-Sectional Design, Descriptive Design, Epidemiological Surveillance, *In-vivo, In-vitro*, Experimental Design, Exploratory Design, Historical Design, Meta-Analysis Design, and Observational Design. c) Evaluation and Factors affecting research design	15
III	**Sampling Design** a) Terms and Concepts used in sampling and sample design b) Steps in sampling design c) Criteria and Characteristics of a good sample design d) Types of Sampling i) Probability Sampling Techniques – Definition, Types, Merits and Demerits ii) Non-Probability Sampling Techniques - Definition, Types, Merits and Demerits e) Sampling and Non-sampling errors f) Measurement scale and Scaling techniques i. Fundamental and Comparative scales- Nominal, Ordinal, Interval and Ratio scales ii. Non- Comparative scales- Continuous rating scale, Itemized rating scale- Likert scale, Semantic differential scale- Stapel scale	15
IV	**Research Tools and Techniques** a) Research tools – Meaning and Purpose b) Methods of data collection- Primary and Secondary c) Types of tools and their uses i) Primary - Questionnaires and Schedule, Interviews, Observation, ii) Secondary	15

	d) Processing of data- Editing, Coding and Tabulation **e)** Report writing–Introduction, Steps, Layout, Types, Mechanics and Precautions	
V	**Statistical Testing of Hypothesis** a) Descriptive Analysis- Graphical and Diagrammatic Presentations, Central Tendency – Mean, Median & Mode, Dispersion -Standard Deviation b) Meaning- Hypothesis, Hypothesis Statement, Hypothesis Testing, Null Hypothesis. c) Types of Hypothesis Testing- i) Parametric Tests or Standard Tests of Hypothesis–Definition, Merits and Demerits, Types and its Applications - Student's T test (Independent, Paired, One tailed and two tailed), ANOVA, Z-test. ii) Non-Parametric or Distribution Free Tests – Definition, Merits and Demerits, Types and its Applications- Chi- square, Spearman's Rank Co-relation, Kruskal Wallis or H test. d) Difference between parametric and non-parametric tests.	15
	Total Hours	**75**

Related Practical Experiences:

1. **Literature Searching**-PubMed
2. **Data Analysis**- Micro Soft Excel, SPSS, Minitab
3. **Plagiarism Checker** – Turnitin, Scribbr
4. **Reference Manager –**Mendeley

References

Text Books:

- Kothari.C.R -Research Methodology, Methods and Techniques, Fourth edition, 2019, New Age International Publisher.
- Gupta.S.C - Fundamentals of Applied Statistic, Sultan Chand and Sons
- Gupta.S.P., Statistical Methods,2018, Sultan Chand and Sons
- Chawla,Deepak and Neena Sondhi Research Methodology, -Concepts and Cases, 2nd Edn,2018, Vikas Publishing House Pvt Ltd.Noida
- Copper, H.M Intergrating Research: A guide for literature reviews. 2nd Edition 2002, California: Sage.

Reference Books:

- Van Maanen - Qualitative Methodology, 1983, Sage Publication
- Kerlinger - Foundation of Educational Research, Wadsworth Publishing Company
- Bryman A. and Cramer D - Quantitative Data Analysis for Social Scientist, Rev.Ed.
- Ranjitkumar- Research Methodology, 4th Ed. Edition, 2014, Sage Publishing.
- Danial, Wayne W and Chad L Cross Biostatistics – Basic Concepts and Methodology for the Health Sciences – International Student Version, 2014, 10th Ed.

Web Resources:

- https://explorable.com/research-methodology
- *https://www.mbaknol.com/research-methodology/the-basic-types-of-research*

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Elaborate on research methodology and research process **CO2**: Draft a research design for problem solving. **CO3:** Apply the appropriate sampling techniques for projects. **CO4:** Plan and design tools for data collection. **CO5:** Interpret the results by performing statistical analysis.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4

CO1	M	M	S	S	S	M	S	M	M	L	L
CO2	M	S	S	S	S	L	S	M	L	L	L
CO3	M	S	S	S	S	L	S	M	L	L	L
CO4	M	L	S	S	S	L	S	L	L	L	L

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	10	10	20	20
Understand	10	5	20	20
Apply	15	20	20	20
Analyse	15	15	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1C08-Public Health Nutrition**		
Class	**II M.Sc.**	**Semester**	**III**
Cognitive Level	**K-1,K-2,K-3,K-4 & K-5**		
Course Objectives	**The Course aims** • To Understand the malnutrition problems. • To gain knowledge on the nations effort in combating community nutrition problems. • To educate the community on the importance of nutrition.		

Unit	**Content**	**Number of Hours**
I	**Concept of Public Health Nutrition** a) Relationship between health and nutrition, determinants and indicators of health and nutrition. b) Role of public nutritionist in the health care delivery system. **Population Dynamics** a)Demographic processes and Demographic cycle b) Demographic profile - population trends in India, density of population, demographic transition, population structure, sex ratio, family size, literacy and education, morbidity rate and life expectancy.	12
II	**Assessment of Nutritional Status** a) Methods of Nutritional assessment, Nutritional anthropometry and Growth standards, b) Biochemical and radiological assessment c) Clinical assessment and Diet Survey **Nutrition monitoring** a) Agencies engaged in nutrition monitoring b) Objectives, Components of nutrition monitoring and key indicators. c) Nutrition in emergencies and disasters - Natural and manmade disasters resulting in emergency situation **Nutritional surveillance** a) Nutritional surveillance system (NSS) - Objectives, Initial Assessment Indicators for use in nutritional surveillance, Triple A Approach.	15
III	**Food Security Programmes** a) Public Distribution System (PDS), Antyodaya Anna Yojana (AAY), Annapurna Scheme, Food for Work Programme. b) Role of national and international organizations to combat	18

	Malnutrition.	
IV	**Strategies to combat public nutrition problems** a) Prevalence of malnutrition in India b) Common nutritional problems c) Causes and preventive measures - PEM, VAD, IDA, IDD, VDD, Obesity and Fluorosis. d) Approaches and strategies for improving nutritional status and health. e) Primary Health Care (PHC) and its role in preventing communicable diseases	16
V	**Information Education and communication** a) Models of communication - Communication Process - Approaches and Barriers to communication, Communication for Extension Education and Development – b) Introduction to IEC Aims and Objectives, Importance of IEC, relevance to programmes. **Nutrition Education** a) Need, Scope, Importance and Theories of nutrition education b) Purpose, Advantages and constraints of Nutrition Education .	14
	Total Hours	**75**

References

Text Books:

- Suryatapadas –Textbook of Community Nutrition,2016, Academic Publishers
- Prabha Bisht- Community Nutrition in India, 2017, Star Publications.
- B.Srilakshmi - Nutrition Science, 2006, New Age International.
- Swaminathan.M- Advanced Textbook on Food & Nutrition Vol 1& 2, Bappco.

Reference Books:

- Park A., Textbook of Preventive and Social Medicine, Twenty Third edition, 2015, Bhanot.
- Gibney MJ - Public Health Nutrition, 2nd Edn, John Wiley &Sons.
- Jellife D.B- Assessment of Nutrition Status of the Community, 1966, WHO, Geneva.

Web Resources:

- https://www.nutrition.gov
- http://www.ninindia.org/community.htm
- https://www.nhp.gov.in/healthlyliving/healthy-diet

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Assess the nutritional status of individuals. **CO2:** Relate health, nutrition and population dynamics of a community. **CO3:** Compile the nutritional interventions provided by the government. **CO4:** Describe the public nutritional problems and appraise strategies to combat malnutrition.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	M	S	S	S	S	S	S
CO3	S	S	S	S	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	15	10	20	20
Understand	15	15	20	20
Apply	10	15	15	15
Analyse	5	5	10	10
Evaluate	5	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1C09- Nutraceuticals and Functional Foods**		
Class	**II M.Sc.**	**Semester**	**III**
Cognitive Level	**K-1, K-2, K-3, K-4 &K-5**		
Course Objectives	**The Course aims** • To learn the principle compounds available in various food groups in aiding good health. • To gain insights into the functional foods which are in nature to prevent and treat diseases. • To vision the impact of globalization on health and food products.		

Units	Contents	Number of Hours
I	**Introduction to Nutraceuticals** a) Introduction to Functional Foods and Nutraceuticals: Definition, History and Classification b) Perceived Effects of Functional Foods c) Nutraceuticals - The link between nutrition and medicine d) Basis of claims for a compound as a nutraceutical e) Natural antioxidants as nutraceuticals	14
II	**Properties, Structure and Functions of Various Nutraceuticals** a) Pigments – Carotenoids, Chlorophyll, Anthocyanin, Anthoxanthin, Curcumin b) Functional lipids c) Flavor and Odor compounds - Alkaloids, Terpenoids, Glycosides, Polyphenols d) Probiotics: Important features of probiotic microorganisms& health effects of probiotic microorganisms e) Probiotic foods – Dairy and Non-dairy probiotics, ICMR guidelines for evaluation of probiotics in food f) Prebiotics: Non- Digestible Carbohydrates- Oligosaccharides, Dietary Fiber, Resistant Starch, Gums	14
III	**Functional Components and Health Effects of** a) Soya, Olive oil, Tea, Common beans, Capsicum annum, Mustard, Ginseng, Garlic, Grapes, Citrus fruits, Fish oils, Sea foods, Mushroom b) Infant formula as functional foods c) Bioavailability and safety issues of functional foods d) Applications of herbs to functional foods	16
IV	**Concept and the Role of Nutraceuticals/ Functional Foods in Health** a) Nutraceuticals for - Cardiovascular diseases, Cancer, Diabetes, Cholesterol management, Obesity, Age Related Macular Degeneration (ARMD), Immune enhancement. b) Mood Disorders	16

	- Compounds and their mechanisms of action c) Adverse effects and toxicity of nutraceuticals	
V	**Recent Advancements in Nutraceuticals and Functional Foods** a) Dietary supplements- GMPS and shelf life of dietary supplements. b) Role of changing food preferences and globalization on selection of nutraceutical products c) Nutrigenomics - An introduction and its relation to nutraceuticals d) Recent advancements and techniques in the formulation and processing of functional foods	15
	Total Hours	**75**

References

Text Books:

- Mary, K. Schmidl - Essentials of Functional Foods, 2000, Culinary and hospitality industry publication services.
- Robert E.C. Wildman - Handbook of Nutraceuticals and Functional Foods, 2001, Culinary and hospitality industry publication services, 2000.

Reference Books:

- Chatwick, R - Functional Foods, 2003, Springer.
- Mazza, G. - Functional Foods- Biochemical and processing aspects, 1998, Culinary and hospitality industry publication services.
- Paresh, C. Dutta, Phytosterols as Functional Food Components and Nutraceuticals, 2004, Marcel DehkerInc, New York.
- Guo M. - Functional Foods – Principles and technology, 2009, Wood head publishing company, UK.

Web Resources:

- https://www.nutraceuticalsworld.com/
- https://www.nutraingredients.com/

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Compile the updates on link between nutrition and medicine. **CO2:** Assess the properties and functions of nutraceuticals. **CO3:** Classify the nutraceuticals and comprehend their role in health promotion. **CO4:** Describe the dietary supplements. **CO5:** Determine the role of globalisation in food choices.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	M	M	S	S	S	S	S
CO3	S	S	S	S	L	L	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	10	15	15	15
Understand	15	10	15	15
Apply	15	15	15	15
Analyse	5	5	15	15
Evaluate	5	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	22UPCND1C10- Nutrition for Sports & Exercise		
Class	II M.Sc.	Semester	III
Cognitive Level	K-1, K-2, K-3 & K-4		
Course Objectives	The Course aims • To develop knowledge of the macronutrient principles of sports nutrition for different types of athletes based on their goals, specifically related to energy and recovery. • To gain knowledge about special topics in the field of sports nutrition.		

Unit	Content	Number of Hours
I	**Introduction** a. Nutritional intake concerns for athletes in sport and exercise;. b. Types of exercise (aerobic and anaerobic) and limiting factors, Exercise intensity and duration c. Fluid balance in sports and exercise, importance, symptoms and prevention of dehydration, Sports drink d. Diet for Junior athlete	15
II	**Macro Nutrients** a. Carbohydrate as an energy source for sport and exercise. b. Carbohydrate stores and supplements c. Fuel utilization during rest and exercise. d. CHO Loading- ATP-PC Changes and lactate changes e. CHO composition for pre exercise, during and recovery period. f. Diets for persons with - High energy requirements, Stress, Fracture and Injury	15
III	**Protein and amino acid requirements** a. Protein turnover during endurance versus resistance training; b. Protein requirement and metabolism during endurance exercise c. Significance of protein in Resistance exercise and recovery process. d. Protein supplement e. Protein needs on vegetarian diet.	15
IV	**Role of Fat as an energy source for sports and exercise** a. Fat stores, b. Regulation of fat metabolism c. Factors affecting fat oxidation (intensity, duration , training status, CHO feeding) d. Dietary Fat and Utilization During Exercise e. Amount of fat recommended for varying level of training,	15
V	**Important micronutrients for exercise** a. B complex vitamin and specific minerals. b. Antioxidant effects to reduce exercise induced oxidative stress;- Antioxidant requirements for exercise. c. Female athletic triad and Sports Anaemia-Assessment for fat; Dietary guidelines and suggestions for fat. Eating disorder. d. Ergogenic Supplements e. Doping control and Supplement testing	15
	Total Hours	**75**

References

Text Books:

- Srilakshmi et al. - Exercise Physiology, Fitness and Sports Nutrition, 2016, New Age International Private Limited
- Dan Benardot – Advanced Sports Nutrition, 2011, 2 edition Human Kinetics, Inc.
- Suzanne Girard Eberle – Endurance Sports Nutrition, 2013, 3rd edn. Human Kinetics, Inc.

Reference Books:

- Nancy Clarke's- Sports Nutrition Guidebook, 2015, 3rd edn. Human Kinetics, Inc.
- Anita Bean – A Complete Guide to Sports Nutrition, 8 edition , 2017, Bloomsbury Sport
- Louise Burke – Clinical Sports Nutrition, 2018, 5th edn. Human Kinetics, Inc.

Web Resources:

- http://www.aco.org.nz/pdf/nutrition-for-sports
  https://www.researchgate.net/publication/258630492_Sports_Nutrition_ Book_2013
- http:// themedicalbiochemistrypage.org

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Apply the art and science of sports nutrition for the wellness of sports personnel. **CO2:** Relate the role and importance of macro and micro nutrients in body maintenance of sports enthusiastic. **CO3:** Describe the dietary supplements for different sports activities. **CO4:** Discuss the role of nutrition in physical performance, recovery and adaptations to exercise.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**	**4**
CO1	S	S	S	M	L	M	M	S	M	M	M
CO2	S	S	S	M	L	M	M	M	L	S	M
CO3	S	S	S	S	L	M	M	S	L	S	M
CO4	S	S	S	S	L	M	S	S	M	M	M

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	15	15	20	20
Understand	15	10	25	25
Apply	10	15	15	15
Analyse	10	10	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1CP05 - Nutraceuticals and Functional Foods Practical**		
Class	**II M.Sc.**	**Semester**	**III**
Cognitive Level	**K-1, K-2, K-3, K-4, K-5 &K-6**		
Course Objectives	**The Course aims** • To enable the students to develop functional food products which meet consumer needs nutritionally and commercially viable. • To prepare and evaluate the different variations of sports drink.		

Unit	**Content**	**Number of Hours**
1.	Documentation of several Nutraceuticals and Functional Foods Available in the Market	4
2.	Preparation and Valuation of Beta Glucan Rich Functional Foods	4

3.	Formulation and Estimation of Lycopene Rich Functional Foods	4
4.	Preparation and Assessment of Probiotic Rich Foods	5
5.	Formulation and Calculation of Prebiotic Rich Foods	5
6.	Preparation and Calculation of Omega 3 Rich Functional Foods	5
7.	Formulation and Evaluation of Vitamin A Rich Foods	4
8.	Preparation and Estimation of Soy Protein Rich Foods	5
9.	Formulation and Evaluation of both Dairy and Non-dairy Calcium Rich Foods	5
10.	Formulation and Valuation of Herbal Foods	4
	Total Hours	**45**

Reference Books:

- Jeffery Horst, Methods of Analysis for Functional Foods and Nutraceuticals, 2002, CRS Press.
- AOAC International. Official methods of analysis of AOAC International
- Linden G. -Analytical Techniques for Foods and Agricultural Products.
- Ranganna. S.- Handbook of Analysis and Quality Control for Fruit and Vegetable Products

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Identify and analyse the various nutraceuticals and functional foods available in the market **CO2:** Develop and evaluate functional foods products. **CO3:** Comprehend the formulations of sports drink. **CO4:** Describe the role of nutraceuticals in herbs.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	M	M	S	S	S	S	S
CO3	S	S	S	S	L	L	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	5	5	5	5
Understand	5	5	5	5
Apply	5	10	10	10
Analyse	15	10	10	10
Evaluate	15	15	15	15
Create	15	15	15	15
Total	**60**	**60**	**60**	**60**

Course Code & Title	22UPCND1SC01- Hospital Dietary Internship		
Class	I M.Sc.	Semester	II (Summer Vacation)
Cognitive Level	K-3, K-4, K-5 & K-6		
Course Objectives	The Course aims • To create opportunities to explore the interests of students in clinical nutrition and dietetics. • To develop professional skills and competencies as clinical dieticians. • To apply what is learnt theoretically to actual practice. • To infer with career development by providing real work experiences.		

Course Outcomes	On completion of the course, students should be able to **CO1:** Identify the different disease conditions. **CO2:** Interpret the relevance of food and nutrition for the disease. **CO3:** Devise an individualized diet plan for patients. **CO4:** Compare and contrast the derived nutritive values with R.D.A using software. **CO5:** Persuade the patients with appropriate diet counselling techniques.

COs Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

M.Sc. Clinical Nutrition and Dietetics Course
SEMESTER-IV

Course Code & Title	22UPCND1C11- Hospital Administration and Practices		
Class	II M.Sc.	Semester	IV
Cognitive Level	K-1, K-2, K-3, & K-4		
Course Objectives	The Course aims • To understand the hospital administration practices. • To comprehend patient data maintaining practices followed in hospitals. • To acquaint with biomedical waste management.		

Unit	Content	Number of Hours
I	**Introduction to Hospital Administration** a) Hospital- Definition, Classification, Functions, Organogram and functions of organisation staff, hospital planning and design, Physical environment, Building elements and materials, installations. b) Hospital Administration- Introduction, Role towards patients, Organisation, Community. c) Attributes, Quality and Skills of a hospital administrator, Challenges and conflicts in hospital administration d) Public relations- Principles of public relations, Responsibility and functions of PRO.	15

II	**Quality Management in Hospital** a) Definition, Concept of Total Quality Management, importance of TQM, Principle of Total Quality management, basic elements of TQM b) Critical Factors Influencing TQM, Total Quality Management Practices in Healthcare, Measuring the Quality in Healthcare Service c) Relationship between Hospitals and Medical Staff	15
III	**Biomedical Waste Management** a) Meaning – Categories of Biomedical wastes b) Disposal of biomedical waste products c) Incineration and its importance d) Standards for Waste Autoclaving e) Micro Waving and Deep Burial – Segregation – Packaging – Transportation – Storage.	15
IV	**Health Records** a) Health record- Types, Functions, privacy, confidentiality and security, Advantages and Disadvantages of the paper record b) Optically scanned records c) The Electronic Health Record (EHR) – Implementation of HER -Advantages and disadvantages of the EHR – Bedside or point-of-care systems – Human factors and the EHR – Roadblocks and challenges to EHR implementation	15
V	**Telemedicine** a) The Future of healthcare technology b) Telehealth- Historical perspectives and Types of Technology, Clinical initiatives and Administrative initiatives, Advantages and Barriers of Telehealth, Future trends and Summary. c) Globalization of Information in Telehealth - Technology in Electronic communication, Knowledge management, Advances in public health, Speech recognition, Wireless computing, Informatics Education and Barriers to Information Technology implementation	15
	Total Hours	**75**

References

Text Books:

- Sakharka B M –Principles of Hospital Administration and Planning, 2010, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
- Kelkar S.A- Hospital Information Systems, 2010, Prentice Hall India Learning Private Limited.
- D.C. Joshi and Mamta Joshi - Hospital Administration, 2011, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

Reference Books:

- Syed Amin Tabish - Hospital and Health Services Administration Principles and Practice, 2001, Oxford Publishers, New Delhi.
- Sharma - Holistic approach to Hospital Waste Management, 2006, AIIMS, New Delhi.
- Arun Kumar - Encyclopaedia of Hospital Administration and Development, 2000, Anmol Publications, New Delhi.

Web Resources:

- https://www.telehealth.net
- http://www.internetmedicine.com/telemedicine

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Compile the duties and responsibilities of administrators in hospitals. **CO2:** Assess the total quality management. **CO3:** Classify the bio medical waste and explain disposal methods. **CO4:** Describe the types and uses of health records. **CO5:** Determine the role of technology in patient care.

COs Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	L	S	M	M	M	M
CO2	S	S	L	L	M	L	S	M	M	M	M
CO3	S	S	M	M	M	S	S	N	N	N	N
CO4	S	S	L	L	L	L	S	L	L	L	L
CO5	M	M	M	M	S	L	S	L	L	N	M

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	15	15	20	20
Understand	15	10	20	20
Apply	10	15	20	20
Analyse	10	10	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1CPR01- Project and Viva-voce**		
Class	**II M.Sc.**	**Semester**	**IV**
Cognitive Level	**K-1, K-2, K-3, K-4, K5 & K-6**		
Course Objectives	**The Course aims** • To synthesise knowledge from all disciplines of learning. • To creatively apply the concepts of nutrition and dietetics in practice. • To enhance the skills of independent thinking and learning. • To develop aptitude to solve hitches during applications. • To create innovative solutions to existing nutrition problems in community.		

Course Outcomes	**On completion of the course, students should be able to** **CO1:** State a nutritional problem prevalent in local community settings and draft a research design for solving. **CO2:** Determine the etiological factors. **CO3:** Plan and design tools for data collection. **CO4:** Apply the appropriate nutritional concepts to research techniques. **5:** Conceive solutions to the defined problems.

COs Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S

CO4	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S
Total Hours								**330**			

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Terminal Examination (Marks)**
Remember	10
Understand	10
Apply	20
Analyse	30
Evaluate	30
Create	100
Total	**200**

ELECTIVE COURSES

Course Code & Title	**22UPCND1E01- Home Science Education and Communication**		
Class	**I/II M.Sc.**	**Semester**	**I / II/ III/IV**
Cognitive Level	**K-1, K-2, K-3, K-4 &K-5**		
Course Objectives	**The Course aims** • To enable students gain knowledge on fibre and yarn. • To familiarise with fabric construction. • To enable students gain knowledge on branches of home science. • To apprehend on skills of communication		

Units	**Contents**	**Number of Hours**
I	**Fibre** a) Types Natural – Cotton, Flax/Linen, Jute, Ramie, Hemp Manmade – Cellulosic, Manmade Synthesized Fibre, Mineral and Elastomeric b) Properties –Physical and Chemical **Yarn** a) Definition, Classification – Simple and Complex b) Yarn twist c) Testing and Identification of yarn **Fabric construction** a) Definition, Types – Woven, Non-Woven, Knitted b) Merits and Demerits	14
II	**Laundering and Laundering Agents** a) Laundering – Types, Principles, Methods and Process b) Laundering agents -Stiffening agents, Bleaching agents, Fabric Softeners c) Dry cleaning –Procedure, Advantages and Disadvantages **Environment Protection** a) Environment Protection –Importance b) Environmental impacts of textile industries - Effluent treatment of water- Importance of Eco-friendly Processing.	11
III	**Concepts of Home Management and Steps** a) Meaning and Importance of Home Management, Basis for Home Management – Values, Goals and Standards	11

	b) Qualities of good home maker, Home management Process- Planning, Controlling, Evaluating **Decision Making** a) Definition, Characteristics and Steps in Decision Making b) Types of Decision **Work Simplification** a) Definition, Symbols, Techniques b) Mundels Class of Change c) Energy Management – Types of Fatigue, Measures to Relieve Fatigue	
IV	**Interior Design** a) Interior Design - Definition and Types b) Colour - Definition, Classification, Prang Colour Chart, Colour Harmonies and Use of Colour in Different Rooms. c) Principles of Design - Harmony, Balance, Proportion, Rhythm and Emphasis d) Elements of Design - Line, Direction, Shape, Colour, Texture and Value **Flower arrangement** a) Principles of Flower Arrangement – Design, Scale, Balance, Harmony, Rhythm, Color b) Patterns and Styles –Symmetrical and Asymmetrical, Traditional, Oriental, Modern, Dried Flower Arrangement. c) Guidelines , Aids and Accessories and Care of flowers	12
V	**Developmental and Educational Communication** a) Communication- Definition, Objectives, Process, Skills b) Types – Interpersonal, Focused and Unfocused, Group, Mass, Verbal Models c) Barriers- Physical, Psychological, Linguistic, Cultural and Mechanical. d) Purpose/ Functions of Communication Essentials of good communication, Seven C's of Communication. e) Class room Communication in Home Science Studies	12
	Total Hours	**60**

References

Text Books:

- Branson, Joan C & Lennox, Margaret-Hotel, hostel and hospital housekeeping, 1973 Edward Arnold, London.
- DeepaliRastogi and Sheetal Chopra -Textile Science, 2017, Orient Blackswan Private Limited.
- SeemaSekhri - Textbook of Fabric science, second edition, 2016,Prentice hall India learning private Ltd
- Seetharaman. P, and Pannu.P-Interior Design and Decoration,2009, Cbs Publishers
- Chaudhari, S.N -Interior Design, Pointer Publishers
- Dahama.O.P and Bhatnagar .O.P - Education and Communication for Development, 1988, Oxford and IBH Publishing,New Delhi
- Dubey V.K. and Bishnoi Indira - Extension Education and communications, 2009, New Age International Pvt. Ltd. Publishers, New Delhi.

Reference Books:

- Bev Ashford - Fibers to fabrics, 2016, Author House, UK.
- Premony Ghosh- Fibre science and Technology,2003, McGraw Hill Education
- Premlata Mullick-Text book of home science, 2000, Kalyani Publisher.
- Sudhir Andrews -Hotel Housekeeping Training Manual, 2009, Tata McGraw-Hill Education.
- Holtzschue, L - Understanding Colour - An introduction for Designers, 4th edn, 2011, Wiley.

Web Resources:

- http://textilelearner.blogspot.com/2011/10/textile-ebooks-free-download-html
- https://www.textilemates.com

Course Outcomes	On completion of the course, students should be able to **CO1:** Classify and explain the properties of the fibres, yarns and fabrics. **CO2:** Determine the laundering procedures for various fabrics and its impact on environment. **CO3:** Compile the concepts of home management, decision making and work simplification. **CO4:** Apply the principles and elements of design, flower arrangement in all art forms. **CO5:** Apply the techniques of communication in different spheres.

COs Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4
CO1	L	L	L	L	M	M	M	L	L	L	L
CO2	L	L	L	L	M	M	M	L	L	L	L
CO3	L	L	L	L	M	M	M	L	L	L	L
CO4	L	L	L	L	M	M	M	L	L	L	L
CO5	L	L	L	L	M	M	M	L	L	L	L

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	20	20	15	15
Understand	10	10	15	15
Apply	10	10	15	15
Analyse	5	5	15	15
Evaluate	5	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	22UPCND1E02- Food Microbiology and Safety		
Class	**I/II M.Sc.**	**Semester**	**I / II/ III/IV**
Cognitive Level	**K-1, K-2, K-3, & K-4**		
Course Objectives	**The Course aims** • To enable the students to learn the methods used for quality assessment of food. • To know about various pathogenic microbes responsible for illness.		

Units	Contents	Number of Hours
I	**Introduction** a) Historical development of food microbiology. b) Morphology, general characteristics and classification of bacteria, fungi and algae. c) Viruses: structure and replication with particular reference to food borne viruses. d) Primary sources of microorganisms in food.	10
II	**Microbial growth** a) Growth of microorganisms- physiological and nutritional need, growth curve and methods of measuring microbial growth. b) Role of intrinsic and extrinsic parameters that affect microbial growth in foods.	10
III	**Microbial spoilage of foods** a)Causes of food spoilage; Microbial contamination of water;	

	b)Spoilage of different group of foods - Milk and milk products; c)Cereals and cereal products; d)Fruits, vegetables and their products; Meat and meat products; d) Fish and fish products; Poultry and eggs; Canned foods.	10
IV	**Food Preservation:** a) Methods and principles of food preservation: b) • Physical: Low temperature; High temperature (pasteurization, canning); Irradiation (UV, microwave, ionization); Drying; High pressure processing c) • Chemical preservatives and natural antimicrobial compounds d) • Biobased preservation systems: LAB and bacteriocins	10
V	**Food Safety and quality control** a) Foodborne hazards b) Microbial hazards: c) Bacterial food poisoning and infections (Bacillus, E.coli, Staphyloccal, Campylobacter, Salmonella, Shigella, Listeria, Clostridium, Vibrio, Mycobacterium) d) Viral foodborne disorders; mycotoxins e) Chemical hazards: Food adulterants, Pesticide residues f) Physical hazards: g) Food Safety principles: Importance and principles of food hygiene and sanitation; Basic principles of food plant sanitation. h) Introduction to food quality control: Indicators of food safety and quality; Microbiological criteria of foods; Legislation for food safety-HACCP and ISO systems; Food standards (FSSAI, Codex Alimentarius, Other Indian standards.	20
	Total hours	**60**

Reference Textbooks:

1. Talaro K and Talaro A., Foundations in Microbiology 10th Ed, WCB publications, USA. 2018.
2. Jay, James, M. Modern Food Microbiology, 7th Ed, Aspen publishers, Inc., Maryland. 2005.
3. Roday, S. Food Hygiene and sanitation, 2nd Edition. Tata McGraw Hill, New Delhi. 2011.
4. Hogg S., Essential Microbiology 1st Ed, John Wiley & Sons, Ltd. England 2005.

Suggested Readings:

1. Doyle P. Michael, Beuchat R.L. and Montville J.T. Food Microbiology Fundamentals & Frontiers, 4th Ed, ASM Press, Washington D.C. 2013.
2. Banwart, G. Basic Food Microbiology, 2nd Ed, CBS Publisher. 1989.

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Explain the concepts of food microbiology and food safety. **CO2:** Determine the causes of food spoilage in different food groups. **CO3:** Discuss the concepts of food borne diseases. **CO4:** Elaborate on Food adulteration and adulterants. **CO5:** Apply the techniques of HACCP.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	L	L	L	L	M	M	M	L	L	L	L
CO2	L	L	L	L	M	M	M	L	L	L	L
CO3	L	L	L	L	M	M	M	L	L	L	L
CO4	L	L	L	L	M	M	M	L	L	L	L
CO5	L	L	L	L	M	M	M	L	L	L	L

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	20	20	15	15
Understand	10	10	20	20
Apply	10	10	15	15
Analyse	10	10	25	25
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1E03- Extension Education**		
Class	**I/II M.Sc.**	**Semester**	**I / II/ III/IV**
Cognitive Level	**K-1, K-2, K-3, & K-4**		
Course Objectives	**The Course aims** • To familiarise the concepts of extension and communication. • To acquaint different methods of extension education. • To apprehend on skills of communication.		

Units	Topic and Details	Number of Hours
I	**Extension Education** a) Extension Education - Meaning, Scope, Objectives b) Principles of Extension c) Difference between Formal, Informal and Non-Formal. d) Extension Education Methods: i) Individual Methods (Farm and Home Visit, Office Call, Personal Letters, Result Demonstration), ii) Group Methods (Method Demonstration, Lecture Method, Field Trips, Group Discussion), iii) Mass Methods: (TV/Radio Recordings, Circular Letters, News Articles, Campaign). iv) Digital Methods of Extension – E-learning, Smart Board, Intra and Internet **e)** Qualities and Role of an Extension Worker	14
II	**National Extension System** a) Integrated functioning of teaching, research and education in ICAR extension system, Agriculture universities, KVK, Trainer's Training centres. b) Extension systems of Ministry of Rural Development, Department of Science and Technology, Department of Women and Child Development, Ministry of Forest and Environment, Development work by NGO's, Government-NGO collaboration.	11
III	**Management and Administration of Formal, Informal and Non-Formal Methods** a) Management- Planning, Organizing, Staffing, Co-ordinating and controlling b) Administration – Definition, Principles, elements c) National Policy on Education. d) Monitoring and Supervision- Functions and Modern Trends, Kothari commission	11
IV	**Theories and Principles of Guidance and Counselling**	

	a) Educational Guidance –Definition, Types – Individual Educational Guidance and Group Educational Guidance b) Functions of Educational Guidance c) Counselling – Definition, Principles, Theories d) Extension Principles in guidance and counselling. School and educational Psychologist- Roles and Responsibilities.	12
V	**Approaches of Communication in Extension** a) Traditional Approach – Folk media b) Modern Approach – Participatory, Analytical, Dialogue, Persuasive and Educational games. c) Modified Approach – Combination of traditional and modern approaches for communication and extension	12
	Total Hours	**60**

References

Text Books:

- Dahama.O.P and Bhatnagar .O.P - Education and Communication for Development, 1988, Oxford and IBH Publishing,New Delhi
- Dr. (Lt.) Sandhya Rani Mohanty -Home Science Extension Education and Rural Development, 2017, Anchor Academic Publishing
- Dubey V.K. and Bishnoi Indira - Extension Education and communications, 2009, New Age International Pvt. Ltd. Publishers, New Delhi.

Reference Books:

- S.V. Supe - An Introduction to Extension,2005, Oxford and IBH Publishing
- Reddy A. A- Extension Education, 1987, Sree Lakshmi Press.
- Khan, P.M. and Somani, L.L.-Fundamentals of Extension Education, 2009, Agrotech Publishing Academy.

Web Resources:

- http://shodhganga.inflibnet.ac.in/bitstream/10603/101775/9/09_chapter%201.pdf

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Compare and contrast the extension education methods. **CO2:** Evaluate the methods of guidance and counselling. **CO3:** Apply the techniques of communication in different spheres. **CO4:** Apply the effective counselling methodologies for patient treatment.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**						**PSO**				
	1	2	3	4	5	6	7	1	2	3	4
CO1	L	L	L	L	M	M	M	L	L	L	L
CO2	L	L	L	L	M	M	M	L	L	L	L
CO3	L	L	L	L	M	M	M	L	L	L	L
CO4	L	L	L	L	L	L	L	L	L	L	L

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	15	15	20	20
Understand	15	15	25	25
Apply	10	10	15	15
Analyse	10	10	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	22UPCND1E04- Food Properties		
Class	I/II M.Sc.	Semester	I / II/III/IV
Cognitive Level	K-1, K-2, K-3, K-4 & K-5		
Course Objectives	The Course aims • To provide a fundamental understanding of physical properties of foods. • To enable students gain knowledge on different method of measuring physical properties in foods. • To Understand the relationship between physical and functional properties of raw, semi-finished and processed food to obtain products with desired shelf-life and quality		

Units	Topic and Details	Number of Hours
I	**Physical Attributes of foods** a) Size, Shape, Particle Size Distribution, b) Volume – Methods of measurement (Liquid Displacement, Gas Displacement, Solid Displacement) c) Expressions of Volume, density, specific gravity, porosity and shrinkage. d) General principles of sampling of foods for analysis. e) Brix value – Importance of brix, calculation of brix in food samples. Hand refractometer f) Salt determination	14
II	**Rheological Properties of Foods** a) Introduction to Rheology b) Flow of Material – Newtonian & Non-Newtonian Fluids, c) Viscosity Measurement - Capillary Flow Viscometers, Orifice Type Viscometers, d) Texture of Foods – Compression, Snapping-Bending, Cutting Shear, Puncture, Penetration, Texture Profile Analysis. e) Dough Testing Instruments – Farinograph and Mixograph, Extensograph and Alveograph, Amylograph. .	11
III	**Water Activity of Foods** a) Determination of water activity in food, b) Importance of water activity in food. c) Factors affecting and influencing the water activity in food, Relationship between water content and water activity in food products. d) Methods of measuring water activity.	11
IV	**Color measurements** a) Color – Measurements (Spectrophotometers & Colorimeters) Color Systems – Munsell Color System; CIE & CIE L*a*b*(CIELAB) Color Systems, Hunter Color Lab. b) Importance of color measurement in food products c) Various measurement methods,- Reflection, transmission , transmittance	12

V	**Thermal Properties of Foods** a) Fourier's Law of Heat Conduction; Thermal Conductivity – Measurement of Thermal Conductivity (Steady State & Unsteady-State Methods); b) Specific Heat – Measurement of Specific Heat (Differential Scanning Calorimeter/DSC), Method of Calculated Specific Heat; c) Thermal Diffusivity (Indirect Prediction Method & Direct Measurement Methods).	12
	Total Hours	**60**

Reference

Textbooks

1. Sahil S and Sumnu S. Physical Properties of Foods, Springer Science, Business Media, New York. 2006.

2. Figura L and Teixerira AA. Food Physics: Physical properties- Measurement and application, Springer-Verlag, Berlin, Heidelberg. 2007.

3. Vliet TV. Rheology and Fracture Mechanics of Foods, CRC Press, Boca Raton: US. 2014.

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Suggested Readings

1. Fellows PJ. Food Processing Technology: Principles and Practice. Ellis Horwood Ltd, USA, 1998.

2. Ramaswamy H and Marcotte M. Food Processing- Principles and Applications, Taylor and Francis group, Florida.2006.

Course Outcomes	On completion of the course, students should be able to **CO1:** Assess the Rheological Properties of Foods **CO2:** Analysis methods of food samples. **CO3:** Compile the physical and functional properties of food. **CO4:** Describe the factors influencing and affecting the measurements of food samples.

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**						**PSO**				
	1	2	3	4	5	6	7	1	2	3	4
CO1	L	L	L	L	M	M	M	L	L	L	L
CO2	L	L	L	L	M	M	M	L	L	L	L
CO3	L	L	L	L	M	M	M	L	L	L	L
CO4	L	L	L	L	L	L	L	L	L	L	L

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	15	10	20	20

Understand	15	15	20	20
Apply	10	15	15	15
Analyse	5	5	10	10
Evaluate	5	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1E05- Entrepreneurship in Clinical Nutrition**		
Class	**I/II M.Sc.**	**Semester**	**I / II/III/IV**
Cognitive Level	**K-1, K-2, K-3& K-4**		
Course Objectives	**The Course aims** • To assist the students to apprehend the scope of entrepreneurship in clinical nutrition and other relevant areas • To understand the rules an regulation to be followed as a entrepreneur • To impart the Practical knowledge for starting a diet clinic and other clinical oriented opportunities in India and abroad as entrepreneurs.		

Units	Contents	Number of Hours
I	**Entrepreneurship** a) Introduction, Defining Entrepreneurship b) Characteristics of Successful Entrepreneurs c) The Creative Process d) Business Requirements for Diet Clinic e) What and Entrepreneur Needs to Consider f) Developing the Business Plan g) Determine the Resources Needed h) Entrepreneurship Development and Training, - know your Patient, Responding to Request, Marketing your Business, Pros and Cons of Yellow Pages Advertising, Patient Feedback.	14
II	**Professions** a) Fitness Nutrition Specialist, Sports Nutritionist, Nutrition Counsellor b) Certified Natural Health Nutritionist, Certified Personal Trainer, Certified Dietitian (CD) c) Business dietitians, Clinical dietitians, Community dietitians, Consultant dietitians, Food service dietitians, Gerontological dietitians, Neonatal dietitians, Paediatric dietitians, Research dietitians, Sports dietitians and other jobs.	12
III	**Regulations** a) Tamil Nadu Clinical Establishments (Regulations) Rules, 2018, Clinical Establishment Act b) Standards for Dietary Counselling Centre – Introduction, Definition, Scope (as applicable) c) Infrastructure Requirements d) Equipments/Instruments, Human Resources, Record Maintenance and Reporting, Basic Processes. e) Licensing Procedures – Training and examination, laws governing diet clinic.	12

IV	**Marketing** a) Introduction to Marketing Management b) Fundamentals of Marketing Principles c) Costing and Cost management, Pricing methods d) Fundamentals of operations and supply chain management opportunity identification and feasibility studies e) Financial studies f) Marketing challenges and approaches for innovations and services	11
V	**Financial Procedures** a) Choice of Technology b) Plant and Equipments for Diet clinic centers & Institutions c) Financing Procedure d) Financial Incentives e) Financial Ratio and their Significance f) Commitment with multiple hospitals.	11
	Total Hours	**60**

References

Text Books

- SS.S.Khanka, 'Entrepreneurship Development', S.Chand and Company 2001.
- Hisrich, Entrepreneurship', Tat Mc Graw Hill, New delhi 2001.
- P.Saravanavel, 'Entrepreneurship Development ', Ess Pee kay Publishing House Chennai - 1997

Reference Books

- Entrepreneurship Development & New Enterprise Management, Directorate of Distance Education, Guru Jambheshwar University
- P.C.Jain (ed.), ' Hand book for for New Entrepreneurs', EDII, Oxford University press, New Dlehi, 1999
- Prasama Chandra Projects - Planning Analysis, Selection, Implementation and reviews'. Tat Mc Graw Hill Publishing Company Limited.
- Singh B.P., Management Concepts & Practices, Dhanpat Rai & sons, Nai Sarak, Delhi.
- Naidu NVR and Krishna Rao T (2009). Management and Entreneurship, I.K. International Pvt. Ltd.
- Jane Eastham, Liz Sharples & Stephen Ball (2001). Food Supply Chain Management, Elsevier Science.
- Dwivedi R.S. Management – An Integrated Approach, National Publishing Co., Delhi.
- Small scale food entrepreneurship: A technical guide for food ventures, authored & published by Northeast Centre for Food Entrepreneurship

Web Resources

- http://www.bareactslive.com/TN/tn1012.htm
- http://clinicalestablishments.gov.in

Course Outcomes	On completion of the course, students should be able to CO1: Establish a foundation of confidence in the skills necessary to cause others to act. CO2: Identify personal attributes that enable best use of entrepreneurial opportunities .CO3: knowledge of the legal and ethical environment impacting business CO4: Ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems. CO5: Understanding Fundamentals of Financial Management, Capital Budgeting and Investment analysis

Cos Consistency with POs and PSOs

CO/PO/PSO	PO							PSO			
	1	2	3	4	5	6	7	1	2	3	4
CO1	M	M	M	L	S	S	M	S	S	N	S
CO2	M	M	M	L	S	S	L	S	S	N	S
CO3	M	M	M	L	S	S	S	S	S	N	S
CO4	M	M	M	L	S	S	S	S	S	N	S
CO5	M	M	M	L	S	S	L	S	S	N	S

*S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation

Assessment Pattern

Bloom's Category	Continuous Assessment Tests(Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	20	20	30	20
Understand	10	10	15	20
Apply	10	10	15	20
Analyse	10	10	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	22UPCND1E06 -Nutritional Counselling and Techniques		
Class	**I/II M.Sc.**	**Semester**	**I / II/III/IV**
Cognitive Level	**K-1, K-2, K-3, K-4 &K-5**		
Course Objectives	**The Course aims** • To enable students gain knowledge on counselling process and techniques. • To familiarise with counselling skills. • To enable students gain knowledge on health psychology and health behaviour • To apprehend on skills of stress management.		

Units	Topic and Details	Number of Hours
I	**Counselling process** c) Counselling – Definition, Expectations, Goals, Scope and Limits. Counsellor – Characteristics of an effective counsellor. The Client – Characteristics, Expectations d) Stages in Counselling – Establishing Rapport • Understanding and Assessing the Problem • Goal Setting • Counselling Intervention Strategies • Termination and Follow up e) Ethics in Counselling	14
II	**Counselling Approaches: Key Concepts and Techniques** a) Counselling techniques, Strategies and Counselling skills- Rapport building and Opening techniques, Questioning, Listening, Reflecting, Acceptance, Silence, Leading reassurance, Non-verbal behaviour, Terminating skills. b) Group Counselling.	11
III	**Nutrition counselling** a) Definition, History, Theories – Behavior modification (Cognitive Behavior therapy, Rational- Emotive therapy, Disinhibition), Standard behavioral therapy, Social learning theory, Transtheoretical model, and Person- centered therapy. b) Counselling skills to facilitate self- Management- Stages of change- Pre-contemplation, Contemplation, Preparation, Action, Maintenance and Relapse and Motivational interviewing	11
IV	**Health Psychology and Health Behaviour** a) Health Psychology- Health Behaviour- Definition of Health Psychology. The Need for Health Psychology, Introduction to Health Behaviour, Factors Influencing the Practice of Health. b) Modification of Health Behaviour – The Patient/Practitioner relationship, Changing Health Behaviour by Changing Health Beliefs, Cognitive Behavioral Approaches to Health Behaviour Change, Appropriate Venue for Health Habit Modification	12
V	**Stress Management and Health Care Intervention** a) Stress and Stress Management- Definition of stress, Categories of stressors, Predisposing factors, Effects of Stress: GAS, Type A behaviour and stress, Methods of Coping with stress b) Health Care Intervention and Prevention- Health enhancing behavior – Diet, Exercise, Weight control, Yoga, Meditation, Development of Healthy Life Style, Quality of life, Influence of health settings on patient behaviour – Out-patient, In-patient, Aftercare, and Home based care.	12
	Total Hours	**60**

References

Text Books:

- Judy Gable (2016), Counselling skills for dietitians, 2nd edition, Blackbail publications.
- Soundarrajan, R. (2012), Counselling – Theory, skills and practice, Tata McGraw Hill publications.
- Lewis E. Patterson (2000), The counselling Process, 5th Edition, Wadsworth, USA.
- Kathleen Bauer, Doreen Liou 2012. Nutrition counselling and education skill development 3rd edition, Wadsworth Cenage Learning.
- Linda Sretselaar, 2009. Nutrition counselling skills for the Nutrition care process. Jones and Bartlett pub, Canada.
- Bestsy B.Holli and Judita A.Beto, 2014. Nutrition counselling and education skills doe dietetics professionals, 6th ed, Lippinkott Williams and Wilkins, Philadelphia.

Reference Books:

- Richard Nelson- jones (2021), Basic counselling skills: A Helper, 4th Edition, SAGE Publications India Pvt

Ltd.
- GPH panel of experts (2018), Counselling Psychology Notes, Gullybaba Publishing House (P) Ltd.
- Isobel R. Contento. 2011. Nutrition Education. Linking Research, Theory and Practice, Second Edition, Jones and Barlett publishers, Canada.
- Calabrese, Richard J., Holli, Betsy B., Beto, Judita A., Maillet, Julie O'Sullivan. 2009. Communication and education skills for dietetics professionals, 5 Edition. Philadelphia, Pa: London: Wolters Kluwer/ Lippincott Williams & Wilkins.
- David F Marks, Michael Murray, Brian Evans, Carla Willig, Cailine Woodall and Catherine M.Sykes, Health Psychology: Theory, Research and Practice. 2nd edition. New Delhi: Sage Publications, 2008.
- Shelley E.Taylor.,Health Psychology. 6th edition. Tata McGraw Hill edition, 1995. Edward P.Sarafino.Health Psychology. Joha Wiley and Sons, 1994.

Web Resources:

- https:/basicmedicalkey.com/patient-counselling-settings-and – techniques/
- https://fadic.net/
- www.medpub.com

Course Outcomes	**On completion of the course, students should be able to** CO1: Acquire knowledge on counselling skills. CO2: Apply technical skills and tools in professional counselling. CO3: Offer personalized counselling based on patient needs. CO4: Educate community on health psychology. CO5: Acquire knowledge on stress management and health care intervention. .

Cos Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**			**Terminal Examination (Marks)**
	I	**II**	**III**	
Remember	20	20	15	15
Understand	10	10	15	15
Apply	10	10	15	15
Analyse	5	5	15	15
Evaluate	5	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	22UPCND1E07- Food Analysis and Instrumentation		
Class	I/II M.Sc.	Semester	I / II/III/IV
Cognitive Level	K-1, K-2, K-3, &K-4		
Course Objectives	**The Course aims** • Theory, potentials and applications of advanced analytical and instrumental techniques employed in food analysis. • The course will focus on providing graduate students with a detailed knowledge of modern techniques used in research and development as well as inspection of food products in industry, analytical laboratory and government. • The course is composed of lectures and hands-on laboratories..		

Unit	Contents	Number of Hours
I	**Introduction to food analysis** a)Types of samples and sampling techniques b) Storage and preservation of samples, expression of results. c) Proximate analysis of foods: Principles of moisture, fat, protein, carbohydrates, crude fiber and vitamins in foods.	12
II	**Sensory analysis of foods:** a) Overview of the sensory principles and practices b) Selection and screening of the sensory panel, types of panel (trained, semi trained), c) Methodology of sensory evaluation: discriminative tests: difference tests, paired comparison, duo trio, triangle; descriptive tests.	12
III	**Instrumentation in food analysis**: **principles, types and applications** – a) Colorimetry and spectroscopy b) Photometry, electrophoresis c) Chromatography d) Atomic absorption spectrophotometry.	13
IV	**Instrumentation in food analysis**: **color measurement in foods** a) X-ray analysis of foods and its applications b) Mass spectroscopy; c) Nuclear magnetic resonance (NMR) d) Differential scanning calorimetry (DSC).	12
V	**Refractometry and ultrasonics in food analysis** a) Texture analysis in foods b) Sensory versus instrumental analysis of texture c) Rapid methods of microbial analysis; immunoassays methods	11
	Total Hours	**60**

Reference

Text Books

- Ronald S. Kirk, Ronald, Sawyer, (1991). Pearson;s Composition & Analysis of foods, 9th Edition Longman scientific & Technical , U.K.
- Pomeranz , Y. & Mrloan (1978) . Food Analysis: Theory and Practice, Westport, connectiant : AVI .
- Amerine, M.A. Pangborn, R.M., and Rosseler, E.B. 1965. Principles of Sensory Evaluation of Food. Academic Press, New York..
- Frazier, R. A., Ames, J.M. and Nursten, H.E. (Eds.). 2000. Capillary electrophoresis for food analysis: method development. Cambridge: The Royal Society of Chemistry. 127 p.
  UBC Woodward Library (QP519.9.C36 F73 2000)

Reference Books

- Horwitz, W. and Latimer, G.W. (Eds.). 1998. Official methods of analysis of AOAC International. 16th ed. Gaithersburg: AOAC International. UBC Woodward Library [electronic resource] (S587.A7 CD-ROM)
- MacRae, R. (Ed.). 1988. HPLC in food analysis. London: Academic Press.
- UBC Woodward Library (TX541.H25.1988)
- Nielsen, S.S. (Ed.). 2003. Food analysis. 3rd ed. Gaithersburg: Aspen Publishers Inc. UBC Woodward Library (TX545.F54 2003)
- Morris, B.A. and Clifford, M.N. (Eds.). 1985. Immunoassays in food analysis. London & New York: Elsevier Applied Sci. UBC Woodward Library (TX545.I448 1983)
- Settle, F.A. (Ed). 1997. Handbook of instrumental techniques for analytical chemistry. Upper Saddle River, NJ: Prentice Hall PTR. UBC Woodward Library (QD79.I5 H36 1997)
- Wilson, R.H. (Ed). 1994. Spectroscopic techniques for food analysis. New York: VCH Publishers, Inc. 246 p. UBC Woodward Library (TX547.S64 1994)

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Apply valid sampling techniques to food materials having widely diverse properties and volumes; **CO2:** Select appropriate analytical techniques for specific food components; **CO3:** Compare advanced and conventional techniques and instruments to analyse chemical and physical properties of foods; **CO4:** Apply a range of chemical analyses of food components; **CO5:** Analyse, interpret and report on results obtained in a scientific format.

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	M	M	M	L	S	S	M	S	S	N	S
CO2	M	M	M	L	S	S	L	S	S	N	S
CO3	M	M	M	L	S	S	S	S	S	N	S
CO4	M	M	M	L	S	S	S	S	S	N	S
CO5	M	M	M	L	S	S	L	S	S	N	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests(Marks)**			**Terminal Examination(Marks)**
	I	**II**	**III**	
Remember	20	20	30	20
Understand	10	10	15	20
Apply	10	10	15	15
Analyse	10	10	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	22UPCND1E08- Food Service Management		
Class	I/II M.Sc.	Semester	I / II/ III/ IV
Cognitive Level	K-1,K-2,K-3,K-4&K-5		
Course Objectives	The Course aims • To develop core knowledge in key areas of various Food Service Systems, its development and also in administration. • To gain efficacy in principles of management. • To progress in food production, standardisation and serving techniques.		

Unit	Contents	Number of Hours
I	**Food Service Institutions and Management** a) History and Development b) Definition and Importance c) Factors Affecting Development of Food Service Institutions d) Principles, Tools (Tangible and Intangible) and Functions of Organizations e) Recent Trends in Food Service Institutions **Various Types of Food Service Institutions** a) Commercial and Non-Commercial Conventional, Commissary, Ready Prepared and Assembly/Serve. Miscellaneous- Contract and Outdoor. b) Theories of Management and Approaches - Classical or Traditional Theory, Neo-Classical Approach, Quantitative Approach, MBO Approach, System Approach, Contingency Approach, JIT Approach, Total Quality Management Approach, Management Science or Operation Research.	12
II	**Food Service Unit Layout and Design** a) Steps and Different Types of Planning, b) Site Selection. c) Various Phases of Layout and Various Factors Influencing Layout Design d) Impact of Design on Efficiency and Safety e) Work Pattern. **Equipments** a) Classification, Selection and Design b) Factors Influencing Selection of Various Equipments c) Equipment Layout 1. Effective Layout 2. Hot Food Preparation d) Base Materials and Finishes in Food Industries e) Installation and Operation f) Care and Maintenance of Equipments.	12
III	**Food Production & Service** a) Type of Menu, Techniques of Menu Writing b) Importance, Principles of Menu Planning in Food Service Institutions c) Procedures and Techniques Used in Institutional and Commercial Food Production d) Standardization of Recipe, Food Cost, SWOT Analysis. And Portion Control e) Principles Involved in Large Scale Cooking Factors in Menu Planning for Large Groups, and Utilization of Leftover Foods in Food Service Institutions.	12

IV	**Material Management** a) Principles of Quantity Food Purchase - Selection, Methods of Buying and Receiving - Dry Storage and Cold Storage - Methods of Delivery and Accounting of Different Foods b) Inventory Management - Types and Methods of Inventory Management - Assessing Requirements and Receiving and Release of Stocks - Safety Stocks and Dead Stocks c) Types of Storage, Maintenance of Food Quality in Storage and Store Record Maintenance. d) Marketing and E-Marketing – Definition, Function, Marketing Mix, Sales Promotion, Selling Techniques and Advertisement e) Franchise Systems in the Hospitality Industry.	12
V	**Personnel Management** a) Definition, Development and Policies b) Staffing - Sources of Recruitment, Selection, Induction, Training, Wages, Salaries, Incentives, Work Appraisals. Promotion, Demotion, Transfer, Dismissal. Managerial Problems of Food Service Unit. c) Directing and Controlling – Direction, Leadership, Delegation, Decentralization, Centralization, Supervision, Human Relations in Industry, Authority and Responsibility, Motivation, Communication, Evaluation Techniques d) Labor Laws and Other Legal Aspects **Financial management** a) Types of Budget, Records for Purchase, Receiving, Storage and Production b) Service and Income and Expenditure Record. c) Costing and Cost Control- - Concept and Measurement of Cost of Capital - Factors Affecting Cost Control - Determining Selling Price of Food - Checklist for Cost Control	12
	Total Hours	**60**

References

Text Books:

- West,B.B. and Wood,L.- Food Service in Institutions,1979, John Wiley, New York
- Wood,C; Kluge,E, Annssem,P.E-The Anatomy of Food Service Design, 1978,C.B.I. Publishing CoInc.
- Sethi, M; Malhan, S. - Catering Management; An integrated approach, 1997, New Age International.
- Kotler,P.,(2019), Principles Of Marketing,13th edition, Pearson.
- Kinton, R., Cessarani, V and Foskett, D, The Theory of Catering, Hodder and Stoughton, 2000.
- Tripathi, P.C. Personnel Management and Industrial Relations, Sultan Chand and Sons, 2000.

Reference Books:

- Livingston,G.E.-Food Service Systems-Analysis,Design and Implementation,1979,Academic press
- Powers, T. F. and Powers, T. M. - Food Service Operations Planning and Control, 1984, John Wiley& Sons.
- Buchanan,R.D- The Anatomy of Food Service Design, 1975,CAHNERSPubl.Co.Inc.
- Boella, M. J. - Personnel Management in the Hotel and Catering Industry, 1983, Hutchinson, London.
- Yadav, C, P. Management of Hotel and Catering Industry, Anmol publications Pvt
- T.Ramaswamy-Principles of Management, 2014, Himalaya publishing house.
- Hitchcock,M.J-Food Service Systems Administration, 1980, Prentice Hall.

Web Resources:

- https://theicn.org/management-and/inventory-tracking-and-managment-guide.pdf
- https://www.scribd.com/document/119449120/History-of-Food-Service-Industry
- cte.sfasu.edu› Hospitality and Tourism› Practicum in Culinary Arts

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Differentiate and contrast the types of foodservice offered in avariety of foodservice settings. **CO2:** Relate food services technology to design layout and operateindustry equipment. **CO3:** Apply nutritional standards as expected in Food ServiceManagement Fields. **CO4:** Demonstrate an understanding of human resource management, financial management, and quality control. CO5: **Perform essential food production and cost control skills.**

COs Consistency with POs and PSOs

CO/PO/PSO	**PO**							**PSO**			
	1	2	3	4	5	6	7	1	2	3	4
CO1	M	M	M	L	S	S	M	S	S	N	S
CO2	M	M	M	L	S	S	L	S	S	N	S
CO3	M	M	M	L	S	S	S	S	S	N	S
CO4	M	M	M	L	S	S	S	S	S	N	S
CO5	M	M	M	L	S	S	L	S	S	N	S

***S- Strong Correlation, M- Medium Correlation, L- Low correlation, N- No correlation**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests(Marks)			Terminal Examination(Marks)
	I	II	III	
Remember	10	10	20	20
Understand	10	10	15	15
Apply	15	20	15	15
Analyse	10	5	15	15
Evaluate	5	5	10	10
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

SUPPORTIVE COURSES

Course Code & Title	**22UPCND1S01- Diet Therapy in Life Style Diseases**		
Class	**I M.Sc.**	**Semester**	**II**
Cognitive Level	**K-1, K-2, K-3, & K-4**		
Course Objectives	**The Course aims** • To enable the students to know the effect of the various life style diseases on nutritional status of individuals. • To enhance the knowledge on dietary requirements for different disease conditions. • To overview the types of diets provided to patients.		

Units	Topic and Details	Number of Hours
I	**Introduction to foods** a) Functions of food b) Food groups c) Planning balanced diets d) Fad diets **Introduction to diet therapy** a) Routine hospital diets- clear fluid, full fluid, soft diet, regular diet b) Nutrition support service c) Malnutrition in hospitalized patients d) Pre and post- operative diets e) Immuno nutrition	12
II	**Diet in Hypertension and Cardiovascular Diseases** a) Hypertension – i) Prevalence ii) Aetiology iii) Symptoms iv) Dietary management b) Cardiovascular Diseases – i) Prevalence, Clinical effects ii) Risk factors, Role of fat in the development of atherosclerosis iii) Dietary management iv) Physical activity and Heart diseases v) Fat substitutes	14
III	**Diet in Diabetes Mellitus** a) Prevalence, types, aetiology and symptoms b) Diagnosis, treatment and complications c) Dietary management	12
IV	**Diet in Cancer** a) Risk factors and Symptoms b) Nutritional problems of cancer therapy	12

	c) Nutritional requirements and Dietary management d) Role of food in the prevention of cancer e) Physical activity and cancer **Autoimmune diseases**	
V	**Diet in diseases of Kidney** a) Functions b) Symptoms and Principles of dietary management –Acute renal failure, Chronic renal failure, Urinary calculi	10
	Total Hours	**60**

References

Text Books:

- Antia F.P. And Philip Abraham-Clinical Nutrition and Dietetics, 2001, Oxford Publishing Company.
- Swaminathan S- Advanced Textbook On Food & Nutrition, 2015, Bappco
- B. Srilakshmi- Dietetics, 2019, 8th Edn, New Age International Pvt. Ltd. New Delhi.

Reference Books:

- Mahan L.K., Sylvia Escott-Stump - Krause's Food Nutrition and Diet Therapy 10th Edition, 2001,W.B. Saunders Company London.
- Passmore P. And M.A. East Wood - Human Nutrition and Dietetics, Churchill Living Stone.
- Raheena M. Begum - A Text Book of Foods Nutrition and Dietetics ¸ 3 edition 2009,Sterling Publishers Pvt. Ltd
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick : Normal And Therapeutic Nutrition,17 th Edn, Macmillan Publishing Company.
- Shills and Young- Modern Nutrition In Health And Disease,2012, Lippincott Williams and Wilkins.
- Bennion M.: Clinical Nutrition, John Wiley & Sons.
- Whitney, E. N. and C. B. Cataldo, Understanding Normal and Clinical Nutrition, 1983, West Pub.
- Williams S. R. Essentials of Nutrition and Diet Therapy**,** 4th edn, 1986, Mosby College Pub. S. Louis.

Web Resources:

- www.anme.com.mx/libros/PrinciplesofNutrition.pdf
- *https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf*
- *krishikosh.egranth.ac.in*

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Apply the principles of diet and determine the dietary essentials for recovery from critical illness. **CO2:** Plan and prepare menu for the given disease condition. **CO3:** Identify and describe the etiology, symptoms and complications for any life style disease. **CO4:** Differentiate feeding techniques.

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	20	15	20	20
Understand	20	15	25	25
Apply	5	10	15	15
Analyse	5	10	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

Course Code & Title	**22UPCND1S02- Nutrition Science**		
Class	**I M.Sc.**	**Semester**	**II**
Cognitive Level	**K-1, K-2, K-3, & K-4**		
Course Objectives	**The Course aims** • To enable the students to learn about the concepts in nutrition science. • To recognize the significance of diet in nutritional problems. • To understand the role of food and nutrients in infections and fever.		

Units	Topic and Details	Number of Hours
I	**Introduction to Nutrition Science** a) History b) Nutrition research in India c) Nutrients- Classification d) Functions of macro and micro nutrients e) Food sources of macro and micro nutrients	12
II	**Protein Energy Malnutrition** a) Etiology and clinical features b) Nutritional requirement c) Treatment and Prevention **Nutritional anaemia** a) Prevalence and causes b) Types – Iron Deficiency, Megaloblastic, differentiating **c)** Prevention	12
III	**Vitamin A Deficiency Disorders** a) Etiology and clinical features b) Nutritional requirement c) Evaluation of Vitamin A status d) Treatment and Prevention	12
IV	**Obesity and Underweight** **a) Obesity**	

	i. Aetiology and theories ii. Assessment, types, treatment iii. Complications, Weight management guidelines, eating disorders **b) Underweight** Aetiology, Nutritional and food requirements	12
V	**Infections and fever** a) Host defence mechanism b) Causes, Types c) General dietary considerations-Typhoid, Influenza, Malaria, Tuberculosis and AIDS d) Nutritional requirements	12
	Total Hours	**60**

References

Text Books:

- Antia F.P. And Philip Abraham-Clinical Nutrition and Dietetics, 2001, Oxford Publishing Company.
- Swaminathan S- Advanced Textbook On Food & Nutrition, 2015, Bappco
- B. Srilakshmi- Nutrition Science, 2016,5th Edn, New Age International Pvt. Ltd. New Delhi.
- B. Srilakshmi- Dietetics, 2019, 8th Edn, New Age International Pvt. Ltd. New Delhi.

Reference Books:

- Mahan L.K., Sylvia Escott-Stump - Krause's Food Nutrition and Diet Therapy 10th Edition, 2001,W.B. Saunders Company London.
- Passmore P. And M.A. East Wood - Human Nutrition and Dietetics, Churchill Living Stone.
- Raheena M. Begum - A Text Book of Foods Nutrition and Dietetics ¸ 3 edition 2009,Sterling Publishers Pvt. Ltd
- Robinson Ch., M.B. Lawlea, W.L., Chenoweth, And A.E., Carwick : Normal And Therapeutic Nutrition,17 th Edn, Macmillan Publishing Company.
- Shills and Young- Modern Nutrition In Health And Disease,2012, Lippincott Williams and Wilkins.
- Bennion M.: Clinical Nutrition, John Wiley & Sons.
- Whitney, E. N. and C. B. Cataldo, Understanding Normal and Clinical Nutrition, 1983, West Pub.
- Williams S. R. Essentials of Nutrition and Diet Therapy**,** 4th edn, 1986, Mosby College Pub. S. Louis.

Web Resources:

- www.anme.com.mx/libros/PrinciplesofNutrition.pdf
- *https://2012books.lardbucket.org/pdfs/an-introduction-to-nutrition.pdf*
- *krishikosh.egranth.ac.in*

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Understand the concepts in nutrition science. **CO2:** Identify and describe the etiology, symptoms and complications for common nutritional problems. **CO3:** Relate the role of food and nutrients in obesity and underweight. **CO4:** Apply the principles of diet and determine the dietary essentials for recovery from infectious diseases.

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)			Terminal Examination (Marks)
	I	II	III	
Remember	15	15	20	20
Understand	15	15	25	25
Apply	10	10	15	15
Analyse	10	10	15	15
Evaluate	-	-	-	-
Create	-	-	-	-
Total	**50**	**50**	**75**	**75**

VALUE ADDED COURSES

Course Code & Title	**22UPCND1V01- Space Nutrition**		
Class	**II M.Sc.**	**Semester**	**III**
Cognitive Level	**K-1, K-2, K-3, K-4 & K-5**		
Course Objectives	**The Course aims** • To familiarize students with changes occurring in the physiology and metabolism of human body during space travel. • To provide in-depth knowledge of nutrients requirement and management during Space travel		

Unit	Content	Number of Hours
I	a) Meaning, Need and scope for space travel b) History of space travel – Mercury, Apollo, Gemini, skylab, ISS and space shuttle	4
II	a) Space walks b) Physiological changes in astronauts body during space expedition	6
III	a) Types of Space Food b) Food systems used in space travel c) Food Preparation for Space	6
IV	a) Health problems associated to space travelers and the control measures	8
V	a) Nutrient requirement during space travel b) Dietary management during space travel.	6
	Total Hours	**30**

References

- Mahan, L.K. and Ecott-Stump, S. (2000). Krause's Food, Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
- Sizer, F. and Whitney, E. (2000). Nutrition – Concepts and Controversies, 8th Edition, West Wadsworth, An International Thomson Publishing Co.
- Whitney, E.N. and Rolfes, S.R. (2003). Understanding Nutrition, 8th Edition, West Wadsworth, An International Thomson Publishing Co.
- Ira Wolinsky (Ed) (2003): Nutrition in Exercise and Sports, 3rd Edition, CRC Press
- Parizkova, J. Nutrition, physical activity and health in early life, Ed. Wolinsky, I. CRC Pres
- Goyet Fish, V., Seaman, J. and Geijer, U. (2008): The Management of Nutritional Emergencies in Large Populations, World Health Organisation, Geneva
- Shills, M.E., Olson, J., Shike, M. and Roos, C. (1998). Modern Nutrition in Health and Disease. 9th Edition, Williams and Williams. A. Beverly Co. London.
- WHO. (1997). Applied health research priorities in complex emergencies, Geneva
- Young, H. and Jaspars, S. (1995). Nutrition matters: People, food and famine, Intermediate Technology Publications, London.
- UNHCR. (1999). UNHCR Handbook of emergencies, 2nd edition, Geneva. UNHCR

Course Outcomes	**On completion of the course, students should be able to**
	CO1: Summarize the basic concepts of Meaning, Need and scope for space travel
	CO2: Explain the History of space travel
	CO3: Describe Physiological changes in astronauts
	CO4: Determine the Food systems & Health problems of Space travellers
	CO5: Discuss the Nutrient requirement & Dietary management during space travel.

Course Code & Title	22UPCND1V02- Principles of Epidemiology in Nutrition
Course Objectives	**The Course aims** • To recognize the principles of epidemiology. • To identify the role of nutritional epidemiology incommunity and public health. • To design and evaluate studies / nutritional programme. • To understand epidemiology of communicable diseases

Units	Topic and Details	Number of Hours
I	**Introduction to Epidemiology** a) Epidemiology: concept and definitions, aims. b) Basic measurements in epidemiology c) Tools of measurement – Rates, Ratios and proportions.	6
II	**Types of epidemiology** a) Descriptive Epidemiology-Defining the population, describing the diseases, measurement of diseases and comparing with knownindices. b) Analytical Epidemiology – Observational studies cohort, case control and cross -sectional analytic study	6
III	**Epidemiological methods** a) Experimental epidemiology – Randomized controlled. b) Design and planning of nutritional epidemiology studies. c) Evaluation of epidemiological studies. d) Uses of epidemiology	6
IV	**Epidemiology of Communicable Diseases** Definition, causes, signs and symptoms **t**reatment and prevention of: a) Communicable diseases b) Respiratory infections c) Intestinal infections	6
V	**Genetics and Health** a) Introduction and cytologic facts b) Classification of genetic disorders a. Cromosomal disorders, Mendelian diseases andErythroblastosisfoetalis c) Preventive and social measures	6
	Total Hours	**30**

References

Text Books:

- Park. A - Park's Text Book of Preventive and Social Medicine, Twenty Third edition, 2015, Bhanot Publishers.
- Bamji M.S, Prahlad Rao N, Reddy V -Textbook of Human Nutrition, 3 edn, 2010, Oxford and IBH Publishing.
- Bamji, Mahtab S., Kamala Krishnaswamy, and G. N. V. Brahmam, eds. Textbook of human nutrition. Oxford & IBH, 2016

Reference Books:

- Anisa Basheer - Environmental Epidemiology, 1995, Rawat Publications, Jaipur
- Beghin I. Cap, M. and Dujardan, B. - A guide to nutritional status assessment, 1988, WHO, Geneva.

Journals:

- Reports of National Family Health Survey, International Institute for Population Science, Mumbai.
- American Journal of Clinical Nutrition

Web Resources:

- https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_occupational_health_students/Epidemiology

Course Outcomes	On completion of the course, students should be able to
	CO1: Describe the concepts, principles and role of epidemiology in public health. **CO2:** Describe the types of epidemiology **CO3:** Apply the epidemiological methods to assess the nutritional status of a community. **CO4:** Associate the concepts of communicable diseases, respiratory infections and & intestinal infections **CO5:** Ascertain the role of genes in health**.**