UNIVERSITY OF PUNE
Interdisciplinary School of Health Sciences
Revised Syllabus 24/10/2020
M.Sc. Health Sciences (Dietetics)

Semester I									
Course Code	Course	Teaching scheme Hours/Week		Examination Scheme and Marks					Credits
				Theory		Practical			
		Theory	Practical	CIA	End-Sem	CIA	PR	Total	
DD1.1	Principles Nutrition and Meal Management DD 1.1A: -Principles of Nutrition DD1.1B: -Meal Management	04	00	30	70			100	04
DD1.2	Clinical Biochemistry	04	00	30	70			100	04
DD 1.3	Physiology	04	00	30	70			100	04
DD 1.4	Diet Therapy	04	00	30	70			100	04
DD 1.5	Practical I		08			30	70	100	04
		16	08	120	280 ??	30	70	500	20
								Total Credits	**20**

Semester II									
Course Code	Course	Teaching scheme Lectures /Week		Examination Scheme and Marks					Credit
		Th.	Pr	Theory		Practical		Total	
DD2.1	Clinical Nutrition & Patient Counseling A. Clinical nutrition B. Patient counseling	4	00	30	70			100	04
DD2.2	Hospital Organization, Catering & Personnel Management A: Hospital Organization & Personnel Management B: Catering Management	4	00	30	70			100	04

DD 2.3	Community Nutrition	4	00	30	70			100	04
DD 2.4	Research Methods	4	00	30	70			100	04
DD 2.5	Practical II		08			30	70	100	04
		16	08	120	280	30	70	500	20
								Total Credit	**20**

Semester III									
Course Code	Course	Teaching scheme Hours/Week		Examination Scheme and Marks					Credit
				Theory		Practical			
		Theory	Practical	CIA	End Sem	CIA	PR	Total	
DD3.1	Exercise physiology, Sports Nutrition & Dietetics	04	00	30	70			100	04
DD3.2	Pediatric and Geriatric Dietetics A: Pediatric Dietetics B: Geriatric Dietetics	04	00	30	70			100	04
DD 3.3	Advance Dietetics	04	00	30	70			100	04
DD 3.4	Practical III		08			30	70	100	04
DD 3.5	Project I	04	00	30	70			100	04
		16	08	120	280	30	70	500	20
								Total Credits	**20**

FOURTH SEMESTER: - (20 credits) 500 marks

DD 4.1 Internship (20credits).

Course Structure:

FIRST SEMESTER: - (20 credits)

DD1.1	Principles of Nutrition and Meal Management DD 1.1A: -Principles of Nutrition DD1.1B: -Meal Management	2 units - 4credits
DD1.2	Clinical Biochemistry	1 unit – 4 credits
DD1.3	Physiology	1 unit - 4 credits
DD 1.4	Diet Therapy	1 unit - 4 credits
DD 1.5	Practical I	1 unit - 4 credits

SECOND SEMESTER: -(20 credits)

DD2.1	Clinical Nutrition & Patient Counseling	1 unit - 4 credits
DD2.2	A: Hospital Organization B: Catering & personnel Management	2 units - 4 credits
DD 2.3	Community Nutrition	1 unit - 4 credits
DD 2.4	Practical II	1 unit - 4 credits
DD 2.5	Research Methods	1 unit - 4 credits

THIRD SEMESTER: - (20 credits)

DD3.1	Exercise Physiology, Sports Nutrition & Dietetics	2 units - 4 credits
DD3.2	Pediatric and Geriatric Dietetics A: Pediatric Dietetics B: Geriatric Dietetics	2 units - 4 credits
DD 3.3	Advanced Dietetics	1 unit - 4 credits
DD 3.4	Practical III	1 unit - 4credits
DD 3.5	Project I	1 unit - 4credits

FOURTH SEMESTER: - (20 credits)

DD 4.1 Internship (20credits).

COURSE OBJECTIVE

The master's program in clinical nutrition and dietetics aims to empower students with essential skills in diet planning applying the dietary guidelines. During the two years programme, students will gain adequate exposure to plan diets for normal or modified nutritional requirements through the life cycle, different clinical conditions and for athletes. Seminars, workshops and internship equip students to be placed in hospital or food service settings. For those interested in research, the course provides training in nutrition research methods and techniques. These skills make them eligible for a career in national and international food sectors, public health nutrition agencies and organizations.

SEMESTER I (20 credits)

DD1.1: PRINCIPLES OF NUTRITION AND MEAL MANAGEMENT

(2 units 4 credits)

Objective:

- To introduce the concept of nutrients in food and its relation to health
- To plan meals for different age groups applying the dietary guidelines
- To apply nutrition principles in meal choices in food service settings

DD 1.1A: -Principles of Nutrition (2 credits)

Concept of Nutrition:

Introduction to nutrition, to emphasize the rationale for defining nutritional requirements with reference to physiological phases such as pregnancy, lactation, and older age

Energy:

Introduction: Energy density, Energy requirements, Energy Expenditure, Energy balance, Measurements: Physiological fuel value, Direct & indirect calorimetry. Basal Metabolic Rate, Total Energy Expenditure, Specific dynamic action, Respiratory Quotient

Carbohydrates:

Types: simple, complex, function, sources, RDA & deficiency. Fiber – types, role in health and diseases.

Lipids:

Definition, types of lipids, fats and fatty acids functions, sources, RDA, & deficiency. Saturated fat, MUFA,
PUFA, essential fatty acids, Cholesterol – introduction, sources, requirement.

Proteins:

Classification of amino acids. (essential & non-essential), functions of protein, sources, RDA & Deficiency. Evaluation of the protein quality – biological value, protein efficiency ratio, nitrogen retention, net protein utilization. – PEM – old and new definitions of undernutrition Kwashiorkar & Marasmus, stunting and wasting).

Vitamins:
Classification – Fat soluble & water soluble, function, sources, RDA & deficiency.

Minerals:
Major minerals – Ca, P, Mg, Na, K.
Minor minerals – Fe, I, F, Zn, Co, Mn, Se, S, Cr.
There function, sources, RDA & deficiency.

Water:
Role of water in the body, its requirement, extracellular & intracellular fluid, maintenance of water balance

DD 1.1B Meal Management (2 credits)

Meal planning: Introduction to meal planning, values and goals in meal planning, Context of menu planning, procedures and refining menu plans
basic five food groups, meal exchange list. Recommended Dietary Allowances: Factors affecting food acceptability. Meal planning for infancy and childhood: RDA during 0-1 yrs, weaning foods. Factors influencing meal planning for Preschool, School going and adolescents.

Meal planning for Adults:
RDA for adult man and woman with different level of activity. Factors influencing the dietary
food selection.

Meal planning for old age:
Nutritional requirement during aging, physiological changes, dietary modification for geriatric
patients.

Meal planning for pregnancy and lactation:
Nutritional requirement for pregnancy and lactation, RDA, Galactagogues.

References:
1. Eastwood, M.A., 2013. Principles of human nutrition. Springer.
2. Lean, M. E. (2019). Principles of human nutrition. Medicine, 47(3), 140-144.
3. Joshi Subhangini A,2007, Nutrition and Dietetics, second edition, Tata McGrawhill, Pub, New Delhi.
4.Radhika, M. S. (2009). Dietary Guidelines. Textbook of Human Nutrition, 3/E, 179.
5. Guthrie H. A, Frances M, Human nutrition
6. Antia F.P, Clinical dietetics and nutrition 7th edition, Oxford University Press
7. Mahan, L.K. and Escott-Stump, S., L. Raymond, J., & Krause, MV 2012. Krause's food and the nutrition care process.
8. Williams S. R, Nutrition and Diet Therapy, C. V Morsby Co. St.Louis.
9. McWilliams, Margaret. Fundamentals of Meal Management, 5/e. Pearson Education India, 1997.

DD1.2 CLINICAL BIOCHEMISTRY (1unit - 4 credits)

Objective:

- To provide an understanding of key nutrients and their role in metabolism
- To demonstrate the energetics and alterations in nutrient metabolism with reference to human health and etiology of disease

Carbohydrate Metabolism:
Classification of carbohydrates, Glycolysis, TCA cycle, Oxidative Phosphorylation, HMP shunt,
Energetics of Aerobic & Anaerobic breakdown, Glycogenesis, Glycogenolysis, Gluconeogenesis.
Regulation of Blood Glucose.

Protein Metabolism:
Classification of Proteins – Amino acids – essential and non-essential. Transamination, Deamination (oxidative & non-oxidative pathways) decarboxylation for amino acids. Urea cycle., Creatine & creatinine synthesis.

Lipid Metabolism:
Classification, Oxidation of fatty acids – odd & even numbered – Beta oxidation. Ketone body formation & ketosis – control mechanism. Lipoproteins – types, Cholesterol synthesis.

Enzymes & Hormones:
Enzymes: Classification, intracellular distribution of enzymes. Enzymes in clinical diagnosis (ALT,
AST, Alkaline Phosphatase).
Hormones: Classification, hormonal control on Carbohydrate, protein & lipid metabolism.
a) Pancreas: Insulin & Glucagon.
b) Thyroid: T3, T4.
c) Parathyroid, calcitonin.
d) Medulla- epinephrine & norepinephrine.
e) Cortex: Glucocorticoids & mineralocorticoids.

Detox pathways:
Liver pathways and phases, glutathione, role of antioxidants

References:

1. Kuchel Philip W, Gregory B. Ralston, 2003, Shaum's Outlines, Biochemistry, Second edition,
Tata Mc Graw Hill Pub.
2. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W., 2014. Harper's illustrated biochemistry. Mcgraw-hill.
3.. Lehningher, A. 2005 "Principles of Biochemistry. Nelson DL and Cox MM Eds.."
4. Satyanarayana U 2017, Biochemistry, Fifth edition, Uppala Author Pub
5. Wu, G., 2013. Amino acids: biochemistry and nutrition. CRC Press.

DD1.3: PHYSIOLOGY (1 unit - 4 credits)

Introduction to Human body: Organs, tissue and cell, cell structure, cellular organelles and their functions, homeostasis and feedback mechanisms

Digestive system: Structure and function of GI tract. Digestion and absorption of protein, fat &CHO. Role of enzymes and hormones

Circulatory and cardiovascular system: Structure and function of blood vessels, Structure of Heart-Cardiac cycle, cardiac output. Blood pressure-factors affecting it, Hypertension, Heart rate and heart
control mechanism.

Blood: Composition, function, homeostasis

Endocrine system: Hormones secreted by endocrine glands, effect on metabolism, hypo, hyperactivity of thyroid, parathyroid, adrenal pituitary, pancreas. Physiology of reproduction, menstruation, pregnancy and lactation. Excretory system and skin. Physiology of Kidney.

Respiratory system: Structural plan of respiratory system, Mechanism of respiration

Skeletal System: Structure of bone – types of bones & joints, development of bone.

Lymphatic system and immunity: Lymphatic system structure and function, Non-specific and
specific resistance, cell mediated immunity, antibody mediated immunity
Reproductive system: Male and female reproductive system, hormones in pregnancy and lactation
Renal system:
Renal function, water electrolyte transport, tubular function, homeostasis

References:

1. Fox, S., 2015. Human physiology. McGraw-Hill Education.
2. Hall, J.E. and Hall, M.E., 2020. Guyton and Hall textbook of medical physiology e-Book. Elsevier Health Sciences.
3. Keele, Neil et.al, 1991, Samson Wright's Applied Physiology, Oxford University Press, Delhi.
4. Shier, D., Butler, J. and Lewis, R., 2018. Hole's essentials of human anatomy & physiology. McGraw-Hill Education.

DD 1.4: DIET THERAPY (1 unit – 4 credits)

Objective:

- To introduce the principles of dietetics and discuss the preventive, promotive and curative role of dietetics in health and disease.
- To apply nutritional knowledge to analyze personal dietary intakes, plan nutritious meals using established criteria to meet nutritional requirements

Introduction to principles of diet therapy, Recommended Dietary Allowances: def., factors, use; Nutrition care plan, Indian RDA, Food Pyramid, Balanced / Normal diet- modification of normal diet to suit special needs. Diets in Fever and Infection.

Fever: Pathophysiology of fever and metabolic changes during fever. Types of fever. Dietary guidelines for fever.

Medical Nutritional Therapy for upper intestinal tract. Introduction to GIT, Esophagitis- types, etiology, symptoms and nutritional care. Gastritis - types, etiology, symptoms and nutritional care. Nutritional care after Tonsillectomy, Dumping syndrome. Gastric and Duodenal Ulcers - pathophysiology, etiology, symptoms, medical therapy and nutritional care.

Medical Nutritional Therapy for lower intestinal tract. Dietary fiber, Flatulence, Constipation Diarrhea, Lactose intolerance, Sprue –Celiac and Tropical, Inflammatory Bowel Diseases – Crohn's Disease and Ulcerative Colitis, Irritable bowel Syndrome, Diverticular Disease.

Medical Nutritional Therapy for diseases of the liver, pancreas and biliary system. Introduction to nutrient metabolism in the liver, Hepatitis - types, etiology, symptoms and nutritional care, Cirrhosis – pathophysiology, etiology, symptoms and nutritional care.

Diet and weight management. Body composition, Underweight. And Obesity – assessment, pathophysiology and etiology. Dietary modification for weight management.

Medical Nutritional Therapy in Diabetes Mellitus. Classification, Pathophysiology, and Etiology. for DM Management of Diabetes mellitus, Insulin – types, action, Dietary treatment, Diabetic emergencies, Artificial sweeteners.

Medical Nutritional Therapy in Hypertension. Classification, types, Etiology, Nutritional Care in Hypertension.

Medical Nutritional Therapy in Coronary Heart Diseases. Important concept, Etiology, Dietary management in CHD, Congestive cardiac failure, Nutritional Care, Lipoproteins, Hyperlipidemia's /Hyperlipoproteinemia's. Nutritional Care in CVDs.

Medical Nutritional Therapy in diseases of the musculoskeletal system. Arthritis, gout, osteoporosis: Pathophysiology, etiology and medical nutritional therapy for musculo-skeletal system.

References:

1. Mahan, L.K. and Raymond, J.L., 2016. Krause's Food & the Nutrition Care Process, Mea Edition E-Book. Elsevier.
2. Lutz, C.A., Mazur, E. and Litch, N., 2014. Nutrition and diet therapy. FA Davis.
3. Mahan Kathleen L, Sylvia Escott Stump, 2001, Krause's, Food nutrition and Therapy, W.B. Saunders
4. DeBruyne, L.K., Pinna, K. and Whitney, E.N., 2015. Nutrition and diet therapy. Nelson Education.
5. Rolfes, S.R., Pinna, K. and Whitney, E., 2020. Understanding normal and clinical nutrition. Cengage learning.
6. Sardesai, V., 2011. Introduction to clinical nutrition. CRC Press.

DD 1.5: PRACTICAL I (1 unit - 4 credits)

Objective:

- To impart practical skills in therapeutic diet planning.
- To familiarize students to the various therapeutic guidelines in diet planning

Course:

Normal nutrition

Diet plan for an adult man and woman – Sedentary, moderate & heavy activity.
Standardization of raw ingredients. Lab work
Standardization of common food recipes. Cooking practical.
Diet planning for pregnant woman, lactating woman, geriatric patient.
Recipes for weaning foods.
Planning regional diets.

Therapeutic nutrition

Modification of normal diet.
Planning therapeutic diets for GI disorders.
a. Peptic ulcer. b. Esophagitis. c. Hiatal hernia.
Planning therapeutic diets in liver disorders. a. Hepatitis b. Cirrhosis. c. Hepatic encephalopathy.
Determination of body composition by means of anthropometry, three-day diet recall calculation.
Diet planning for obesity.
Diet planning for diabetes. (insulin dependent and non- insulin dependent, Gestational diabetes.
Diet planning for cardiovascular disease: - Hyperlipidemia, hypertension, and arteriosclerosis, congestive cardiac failure.

References:

1. Sesikeran, B., 2010. Revised RDA for Indians. National Institute of Nutrition ICMR, Hyderabad.
2. Dietary guidelines for Indians. A manual 2011. Nat Inst Nutrition, 2, pp.89-117.
3. NIN and ICMR, 2004. Nutrition for mother and Child, Hyderabad.
4. Mahan, L.K. and Raymond, J.L., 2016. Krause's Food & the Nutrition Care Process, Mea Edition E-Book. Elsevier.
5. World Health Organization. (1995). The use and interpretation of anthropometry: report of a WHO expert committee. World Health Organ Tech Rep Ser., 854, 312-409.
6. Mueller, C., Compher, C., Ellen, D.M. and American Society for Parenteral and Enteral Nutrition (ASPEN) Board of Directors, 2011. ASPEN clinical guidelines: nutrition screening, assessment, and intervention in adults. Journal of Parenteral and Enteral Nutrition, 35(1), pp.16-24.

SEMESTER II (20 credits)

DD 2.1 A: CLINICAL NUTRITION AND PATIENT COUNSELLING (2 units – 4 credits)

DD 2.1 A: Clinical nutrition (3 credits)

Objective:

- To impart knowledge on etiology of various medical conditions for application of medical nutritional therapy.

Medical Nutritional therapy in renal diseases: Nephrotic syndrome, Nephritic syndrome, ARF, CRF/ESRD, Dialysis and Kidney Transplant.

Medical Nutritional therapy for: Surgery, burns, sepsis, and trauma.

Medical Nutritional therapy in cancer.

Medical Nutritional therapy in HIV and AIDS.

Diet for Anemia: Types of Nutritional anemia, nutritional therapy.

Medical Nutritional therapy in diseases of musculo skeletal system: Rheumatoid & osteoarthritis, gout, osteomalacia & osteoporosis.

Medical Nutritional therapy in neurological disturbances and in-born errors of metabolism.

Medical Nutritional therapy for oral and dental health.

Medical Nutritional therapy in malabsorption syndrome.

Dietary modification in food allergy and intolerance.

Drug and nutrient interaction.

Importance of evidence-based nutrition practice guidelines, code of ethics in nutrition and dietetics profession

Seminar: -Ayurveda- Concept of prakruti or constitutional response & nutritional modification, Functional foods.

References:

1. Shils Maurice, James A. Olson, Skike Mosche, Catherine Ross, 2006, Modern Nutrition in health and disease, Tenth edition, Williams and Wilking pub.
2. Katz, D.L., 2014. *Nutrition in clinical practice*. Lippincott Williams & Wilkins.
3. Bahl Saroj and J.F Hickson, Nutrition care for HIV Positive patient, A Manual for individuals and their caregivers
4. Pandya Sanjay, 2007, Practical guidelines on fluid therapy, Second edition.
5. Mahan Kathleen L, Sylvia Escott Stump, 2001, Krause's, Food nutrition and Therapy, W.B. Saunders Co
6. Mahan, L.K. and Escott-Stump, S., L. Raymond, J., & Krause, MV 2012. Krause's food and the nutrition care process.

DD 2.1B: Patient counseling (1 credit)

Objective: To introduce the technical concepts in counseling, skills required by a dietician, her/his role in a hospital.
To enable the student's ability to interpret pathological / clinical parameters in health & disease. Dietitian as part of the medical team and outreach services.

Clinical information: Medical history and patient profile techniques of obtaining relevant information. Record of nutritional status, Diet recall, Life style, physical activity, stress. Correlating Relevant Information and identifying areas of need.

The nutrition care process: Setting goals and objectives for care, Patient Education, Dietary Prescription. Working with hospitalized/ out patients (adults, pediatric, elderly, and handicapped), Motivating patients. Follow up and evaluation of outcome, maintaining records, reporting findings, applying findings

Nutrition counseling
Counselling approach, skills, patient/participant interview,
Resources and aids for education and counseling, terminating counseling,

References:
1. Mahan Kathleen L, Sylvia Escott Stump, 2001, Krause's, Food nutrition and Therapy, W.B. Saunders Co
2. Anthro, W.H.O., 2006. Software for assessing growth and development of the world's children. World Health Organization.
3. Sanders, T.A., 2004. Diet and general health: dietary counselling. Caries research, 38(Suppl. 1), pp.3-8.

DD 2.2: HOSPITAL ORGANIZATION, CATERING AND PERSONNEL MANAGEMENT (2 units - 4 credits)

DD 2.2 A Hospital Organization (2 credits)

Objective:

- The objective of this course is to introduce hospital as an organization, importance of personnel management and to provide an overview of the functioning of the hospital dietary department.

Organization:
Introduction, organization charts-pertaining to hospitals.
Organizations: Types of organizations and characteristics.
Organizational charts of the dietary department.
Types of food service-centralized & decentralized food service.

Leadership, motivation & communication:
Dietician as a leader, leadership qualities, types of leadership.
Relation between motivation & performance, theory of motivation
Communication:
Need to communicate, type of communication, skills of communication.
Personnel management:
Manpower planning, recruitment, selection, induction, performance appraisal, training & development.

Purchase & storage:
Purchasing- Types of market, inventory, selection of food, Periodical quality control check of food. Storage & records required.

Laws and guidelines:
Food laws, Labor laws. Health care standards

Industrial meal management:
Quality management of sanitation and safety procedures, facilities design, labor relations food service management of healthcare standards, and, financial and business management.

References:

1. Boella, M. J. (1983). Personnel Management in the Hotel and Catering Industry. Hutchinson, London.
2. Drucker, P. S. (1975). Management. Allied Publishers. New Delhi.
3. Hitchcock, M. J. (1980). Food Service Systems Administration Mac Millan. New York.
4.West, B. B. and Wood, L. (1979). Food Service in Institutions. John Wiley, New York
5. Sekhar, S.C., 2008. Hospital Organization Structure. *Managing a Modern Hospital*, *48*.

DD 2.2B: Catering Management (2 credits)

Objective:

- To provide an overview of the skills required for the management of mass food production and service.

Introduction to food services and catering industry: Development of Food Service Institutions in India. Types of Services as affected by changes in the environment. Hospital food service as a specialty. Characteristics, rates and services of the food production, service and management in hospitals. Role of the Food Service Manager/ Dietitian.

Catering Management: Definition, principles and functions, tools of management resources. Attributes of a successful manager.

Management of Resources: Capital, space, equipment and furniture, materials, staff, time and energy, procedures physical facility design and planning. Equipment selection. Purchase and storeroom management Purchase systems, specifications, food requisition and inventory systems, and quality assurance. Financial Management (in brief since there is a separate subject Food Cost and Quality Control). Elements of Financial management. Budget Systems and accounting. Budget
preparation.

Food Production and Service Operations
General Planning, Preliminary planning, Consideration of patients with specific nutritional and dietary needs, labor use, and productivity. Pattern and flow of services.

References:

1. Sethi, M; Malhan, S. (1997). Catering Management; An integrated approach. New Age International.
2. Sullivan Catherine F (1990). Management of Medical Food Service 2nd Edition, Van Nostrand Reinhold, New York.
3. Livingston, G.E. (1979). Food Service Systems-Analysis, Design and Implementation - Academic Press.
4. Powers, T. F. and Powers, T. M. (1984). Food Service Operations Planning and Control. John Wiley & Sons.
5. Boella, M. J. (1983). Personnel Management in the Hotel and Catering Industry. Hutchinson, London.
6. Hitchcock, M. J. (1980). Food Service Systems Administration Mac Millan. New York.
7. West, B. B. and Wood, L. (1979). Food Service in Institutions. John Wiley, New York.

DD 2.3 COMMUNITY NUTRITION & EPIDEMIOLOGY (1 unit - 4credits)

Objective:

- To familiarize students to the global and national burden of nutritional deficiencies and the public health nutrition interventions
- To emphasize the significance of nutritional policies and programs and its impact on nutritional status of the population

Course content:

Introduction to public health nutrition: Nutrition epidemiology, measurements in public health, prevalence, rates, ratios

Nutrition Transition: Demographic, economic transition, poverty alleviation, food consumption patterns

Undernutrition: global and Indian prevalence of undernutrition, risk factors consequences

Micronutrient deficiency disorders: Prevalence, risk factors, Interventions that worked globally, lessons learnt.

Overnutrition: Evolutionary principle, Obesity: prevalence and risk factors: Physical activity and inactivity, screening of those at nutritional risk, Life style diseases: Interventions that worked globally, lessons learnt. Guidelines for prevention of non-communicable diseases

Food Security: Factors affecting food security, economics food security and community development, Food security bill

Schemes and programs in India to combat nutritional problems. Role of international, national and voluntary agencies and government departments. Nutrition Policy of India and Plan of Action.

Maternal and child health programs by Government of India, Nutrition sensitive and nutrition specific interventions, behavior change communication

Assessment of nutritional status- Meaning, need, objectives and importance. Use of clinical signs, anthropometry, biochemical tests, and biophysical methods. Assessment of food and nutrient intake through recall, record, Weighment.

References

1. Vir S.C., (2015), Public health nutrition in developing countries (Part I and II), Woodhead Publishing India Pvt, Ltd.
2. WHO and Chan, M., (2011) 'Haemoglobin concentrations for the diagnosis of anemia and assessment of severity', Geneva, Switzerland: World Health Organization, Geneva pp. 1–6.

3. Cashman, K. D., Sheehy, T., & O'Neill, C. M. (2018). Is vitamin D deficiency a public health concern for low middle-income countries? A systematic literature reviews. European journal of nutrition, 1-21.

Links

1. www.cdc.gov/nutritionreport/99-02/part_3.html
2. www.fao.org/ag/agn/nutrition/ind_en.stm
3. nihfw.org/pdf/Brochure_Public%20Health%20Nutrition.pdf
4. www.unicef.org/india/nutrition_1556.htm
5. nutritionfoundationofindia.res.in/.../Nutrition%20Transition%20in%20in...

DD 2.4 RESEARCH METHODS (1 unit - 4 credits)

Objectives:

- To orient students to basic research methods in public health, clinical nutrition and dietetics
- To nurture skills in relevant research methods and updating the advances in nutrition research.

Course:

Review of scientific literature
Selection of a topic
Formulating research questions and objectives
Selection of study design: Cross sectional, longitudinal, interventional, RCT
Sample and sampling techniques
Tools and techniques: pretesting, validity and reliability of tools
Data management
Data analysis: Skills in statistical methods for data analysis.
Report writing
Ethics in research: Biosafety and regulation

References

1. Fundamentals of Statistics (Seventh Edition): S.G. Gupta. Himalaya Publication, Mumbai, 2017
2. Gordis Leon. Epidemiology (Fifth edition), Elsevier Saunders, 2013
3. Willett, W. (2012). Nutritional epidemiology. Oxford University Pres
4. Margetts, B. M., & Nelson, M. (Eds.). (1997). Design concepts in nutritional epidemiology. OUP Oxford

DD 2.5: PRACTICAL II (1 unit - 4 credits)

Objective:

- To provide practical skills in dietary planning and patient counselling.
- To impart skills in the various techniques of assessment of nutritional status, rinciples of precision, accuracy, and interpretation of results for individuals and populations.

Nutritional assessment

Nutritional screens - Physical examinations, Biochemical and biophysical assessment methods.
Biochemical Analysis - Estimation of Hemoglobin, S. Ferritin.
Analysis of proteins: Total protein, serum albumin, globulin, AG Ratio
Identification of sugars: glucose, maltose, fructose, estimation of blood glucose
Enzymes of clinical significance: SGOT, SGPT, ALP
Lipid profile: serum total cholesterol, LDL, VLDL, HDL, TG, LDL:HDL ratio
Urine analysis for urea, uric acid, creatinine, glucose, protein

Diet planning

Renal diseases: Nephrotic syndrome, Nephritic syndrome, ARF, CRF/ESRD,
Dialysis and Kidney Transplant.
Surgery, Burns, Sepsis, and Trauma.
Cancer
HIV and Aids.

Analyzing hospital case studies: Familiarize students in observing hospital case studies

References:

1. Manual, A., 2011. Dietary guidelines for Indians. *Nat Inst Nutrition*, *2*, pp.89-117.
2. Longvah, T., Anantan, I., Bhaskarachary, K., Venkaiah, K. and Longvah, T., 2017. *Indian food composition tables*. Hyderabad: National Institute of Nutrition, Indian Council of Medical Research.
3. Mahan Kathleen L, Sylvia Escott Stump, 2008, Krause's, Food nutrition and Therapy, W.B.
4. Saunders.
5. Mueller, C., Compher, C., Ellen, D.M. and American Society for Parenteral and Enteral Nutrition (ASPEN) Board of Directors, 2011. ASPEN clinical guidelines: nutrition screening, assessment, and intervention in adults. *Journal of Parenteral and Enteral Nutrition*, *35*(1), pp.16-24.
6. Raghuramalu, et.al. 2003. A Manual of Laboratory Techniques, NIN, Hyderabad.
7. Mohanty, B. et.al. 2006. Fundamentals of Practical Biochemistry. B.I. Pub

SEMESTER III

DD 3.1: EXERCISE PHYSIOLOGY, SPORTS NUTRITION AND DIETETICS (2 units – 4 credits)

DD 3.1A: Exercise Physiology (2 credits)

Objective:

- To provide the fundamentals of exercise physiology
- To orient students about the importance of nutrients in exercise, and sports performance

Bioenergetics: Introduction to energy transfer, Energy transfer in exercise (immediate, short term, long term energy systems), and measurement of human energy expenditure.

Body composition: types, assessment of body composition, anthropometry.

Respiratory response of athletes to exercise: anatomy and physiology, gas exchange and transport regulation of ventilation during exercise, acid base balance.

Cardiovascular response to exercise and training: anatomy and physiology, cardiovascular regulation and interaction, function capacity of the cardiovascular function

Skeletal muscle: Structure and function, fiber types and differences, adaptation in skeletal muscle in response to training, anaerobic metabolism and muscle fatigue during high intensity

Endocrine system and exercise: Endocrine response to exercise

Exercise performance and environmental stress: exercise at medium and high altitude, exercise and thermal stress.

Sports injuries: Basic management principles.

References:

1. Porcari, J., Bryant, C. and Comana, F., 2015. *Exercise physiology*. FA Davis.
2. MC Ardle, Katch F.L, Katch V, 2010, Exercise Physiology; energy nutrition and human performance 5th ed Lippincott, Williams & Wilkins.
3. Brown Stanley P, Miller wayne C, Eason Jane M, 2006, Exercise Physiology, Lippincott, Williams & Wilkins.

DD 3.1B Sports nutrition & dietetics (1 unit - 2credits)

Objective: To provide a broad coverage of the key areas of sports nutrition

Nutrition in exercise and sports: energy balance, energy needs for post exercise recovery, protein needs for exercise and muscle gain, and Blood lipids for endocrine function and inflammation control
Importance of micronutrients in exercise and sports, maintaining blood levels, improving performance

Diet and sports performance, fluid and electrolyte loss and replacement during exercise, maxing weight for sports participation, Nutritional ergogenic aids/ supplements and exercise performance, guidelines for use of performance enhancing substances, adverse effects, toxicity, eating disorders in athletes

Anthropometry: Anthropometry, somatotyping, body composition, assessment, obesity and weight control

Sport Psychology: Definition of key concepts in sports psychology, how mind affect the athlete's physical performance, ideal performance state, motivation, arousal, mental / mind training, relaxation.

Biomechanics: Introduction definition, Newton's laws, examples of application of biomechanics

Exercise and sports across age and gender: The female/male athlete, exercise and pregnancy, children and elderly.

References:

1. McArdle, W.D., Katch, F.I. and Katch, V.L., 2010. Exercise physiology: nutrition, energy, and human performance. Lippincott Williams & Wilkins.
2. Brown, S.P., Miller, W.C. and Eason, J.M., 2006. Exercise physiology: basis of human movement in health and disease. Lippincott Williams & Wilkins.
3. Wolinsky, I. ed., 1997. Nutrition in exercise and sport. CRC press. Wolinsky Ira, Nutrition in exercise and sports, 3rd Ed CRC press, New York.
4. Driskell, J.A. ed., 2007. Sports nutrition: fats and proteins. CRC Press.
5. Benardot, D., 2020. Advanced sports nutrition. Human Kinetics Publishers.
6. Kerksick, C.M., Wilborn, C.D., Roberts, M.D., Smith-Ryan, A., Kleiner, S.M., Jäger, R., Collins, R., Cooke, M., Davis, J.N., Galvan, E. and Greenwood, M., 2018. ISSN exercise & sports nutrition review update: research & recommendations. Journal of the International Society of Sports Nutrition, 15(1), p.38.

DD 3.2 PEDIATRIC AND GERIATRIC DIETETICS (2 units - 4credits)

- **Objective:**
- The course is aimed to provide insights into the specific nutrient needs for mothers, children and adolescents, various policies and their impact
- To impart knowledge on the biology and nutritional needs of the elderly

DD 3.2A: Pediatric Dietetics (2 credits)

Maternal physiological adjustments in pregnancy and their relationship to nutritional needs; effect of maternal nutrition on fetal growth and development; physiology of lactation and maternal nutrient needs.

Neonatal nutritional needs and infant feeding practices. Nutrition for premature, low birth weight infants.

Normal nutrition from infancy through adolescence: Growth and development, nutritional requirement, nutritional Assessment.

Malnutrition: Stunting, wasting and moderate underweight and childhood 0besity. Inborn errors of metabolism. Guidelines for management of SAM and MAM, ECD Management of childhood undernutrition

Nutritional considerations for special children: autism, downs syndrome, nutrition for prevention of childhood disabilities and birth defects

Training in i) Facility-based management of undernourished / LBW/ children
ii) Infant and Young Child Feeing practices (IYCF)
iii) Early child development

DD 3.2B: Geriatric Dietetics (2 credits)

Physiologic changes associated with aging: - Changes in taste, decrease in G.I. Motility, decrease in lean body mass, decrease in the ability to concentrate urine, bone mass decrease.

Nutritional requirements of the elderly: The effects of aging on fundamental nutrition processes, food and nutrient requirements: Energy, CHO, Protein, Fat, Vitamin & Mineral and
water. Nutrition for prevention of degenerative conditions

Assessment of nutritional status: nutrition screening and assessment of nutritional status. Nutrition intervention and food assistance programs.

Nutrition related disorders of older adults: Malnutrition, obesity, anemia, osteoporosis etc. Other health problems: Alzheimer's disease, arthritis, Parkinson's disease, cancer, cerebrovascular accident, COPD, CHD, DM. food and drug Interaction.

References:

1. Chernoff R, Geriatric Nutrition-The Health Professionals hand book, Jones and Barlett Pub.
2. Meydani M, 2001, Nutrition interventions in Aging and age associated disease, Ann NY Acad Sci 928:226.
3. Vellas B etal; 1999, Mini Nutrition assessment (MNA): Research and Practice in the elderly, Nestle Nutrition workshop Series- clinical and performance programme.
4. Merk 2000, Merk Manual, Protein Energy under nutrition in elderly, Whitehouse station
5. Elizabeth K.E.,2005, Nutrition and child Development, 3rd edition, Paras Publishing.
6. Mahan Kathleen L, Sylvia Escott Stump, 2001, Krause's, Food nutrition and Therapy, W.B. Saunders
7. Joshi Subhangini A, 2007, Nutrition and Dietetics, second edition, Tata McGrawhill, Pub, New - Delhi

DD 3.3 ADVANCED DIETETICS (1 unit - 4 credits)

Objective:

- To expose the students to the guidelines of enteral and parenteral nutrition
- To train students in the application of guidelines in patient care

Enteral nutrition: - Tubes & techniques of delivery, Clinical uses & formulation,

complications of enteral nutrition, Home Enteral tube feeding. Pediatric Enteral Nutrition.

Parenteral Nutrition: Venous access, Nutrition formulation.

Nutrition support in trauma & sepsis.

Nutrition support in liver diseases.

Nutrition support for the intensive care unit.

Nutrition support in respiratory diseases.

Nutrition support for surgical patients.

Nutrition support in cancer.

Nutrition support in HIV infection.

References:

1. Bankhead, R., Boullata, J., Brantley, S., Corkins, M., Guenter, P., Krenitsky, J., Lyman, B., Metheny, N.A., Mueller, C., Robbins, S. and Wessel, J., 2009. ASPEN enteral nutrition practice recommendations. *Journal of Parenteral and Enteral Nutrition*, *33*(2), pp.122-167.
2. Kreymann, K.G., Berger, M.M., Deutz, N.E., Hiesmayr, M., Jolliet, P., Kazandjiev, G., Nitenberg, G., Van den Berghe, G., Wernerman, J.D.G.E.M., Ebner, C. and Hartl,W., 2006. ESPEN guidelines on enteral nutrition: intensive care. *Clinical nutrition*, *25*(2), pp.210-223.

3. Robinson C, Lawler W.L, Chenoweth, A.E Garwick, 1986, Normal and therapeutic Nutrition, I7th edition McMillan Pub.216
4. Mahan Kathleen L, Sylvia Escott Stump, 2008, Krause's, Food nutrition and Therapy,
5. W.B. Saunders.
6. Williams S.R.1986, Essentials of nutrition and diet therapy, 4th edition, Morsby College Pub.
7. Pane Jason, 2001 Artificial Nutrition support in Clinical Practice.
8. Kirsby 2004, Practical hand book of Nutrition in Clinical practice.
9. Baker and Baker,1997 Pediatric Parentral Nutrition, IT PUB
10. Pandya Sanjay, 2002, Practical guidelines on fluid Therapy, Bhalani Distributors

DD 3.4 PRACTICAL III (1 unit - 4 credits)

- **Objective:** To impart practical training to the students in specialized dietary planning.

Geriatric diet planning in health and diseases:

Assessment of the Nutritional Status.

Dietary planning for elderly.

Dietary planning for aging related disorders.

Dietary planning for sportsman:

Pre, during and post competition meal.

Carbohydrate super saturation.

Dietary planning for:

Enteral and parenteral nutrition support in liver diseases.

Enteral and parenteral nutrition support for the intensive care unit, trauma & sepsis.

Enteral and parenteral nutrition support in Respiratory Diseases.

Enteral and parenteral nutrition support for surgical patients.

Enteral and parenteral nutrition support in cancer and HIV infection.

Visit to clinical setting for enteral formula preparation and food industry.

References:

1. Mahan, L.K. and Escott-Stump, S., L. Raymond, J., & Krause, MV 2012. *Krause's food and the nutrition care process*.
2. Williams S.R.1986, Essentials of nutrition and diet therapy, 4th edition, Morsby College Pub.

3.Mueller, C., Compher, C., Ellen, D.M. and American Society for Parenteral and Enteral Nutrition (ASPEN) Board of Directors, 2011. ASPEN clinical guidelines: nutrition screening, assessment, and intervention in adults. *Journal of Parenteral and Enteral Nutrition*, *35*(1), pp.16-24

4. Pane Jason, 2001 Artificial Nutrition support in Clinical Practice.

5. Kirsby 2004, Practical hand book of Nutrition in Clinical practice.

6. Baker and Baker,1997 Pediatric Parentral Nutrition, IT PUB

7. Pandya Sanjay, 2002, Practical guidelines on fluid Therapy, Bhalani Distributors

DD 3.5 PROJECT I (1 unit - 4 credits)

- **Objective:** To train students in all aspects of executing a research project

Review of literature
Selection of a topic
Selection of study design
Planning and implementation of the research project
Data management
Data analysis
Report writing

SEMESTER IV (20 credits)

DD 4.1 INTERNSHIP (20 credits)

Objective:

- An internship program of six months' duration, in order to expose students to the practical aspect of dietetics in an approved Government and Private hospital preferably under a registered dietician or institute/ organization concerned with imparting diet counselling skills.
- To impart practical knowledge in diet planning and patient counseling.
- To enable students to acquire specialized knowledge in planning therapeutic diets (like diabetes, cancer, heart diseases, renal disease, sports diets etc.)

Course:

Case-studies
Diet plans
Discharge diet
Report writing
Case study presentations

Students will submit the final internship report at the end of fourth semester.