Vidyasagar University
Midnapore-721102, West Bengal

The SYLLABUS for
POST-GRADUATE Programme

in

CLINICAL NUTRITION AND DIETETICS

Under Choice Based Credit System (CBCS)
(Semester Programme)

[w.e.f. 2022-23]

PROGRAMME OUTCOME

This course will provide a leading-edge learning of fundamental principles and specialized knowledge in the field of Clinical Nutrition and Dietetics. The course curriculum will develop suitable skills and outlooks in therapeutic nutrition and counseling services for the purpose of disease management/malnutrition. The course will boost the necessities of health professionals and nutritionists/dieticians in different governmental and non-governmental sectors. The course will generate skilled nutritionists with up-to-date nutrition knowledge, management skills as dynamic partner in health care system. The proficient learners will be also engaged in widespread settings including academic, corporate, military and community based establishments. This course will be also helpful for lucrative self-employability as dietitian.

M.Sc. in CLINICAL NUTRITION AND DIETETICS

COURSE STRUCTURE

SEMESTER	COURSE NO.	COURSE TITLES	Full Marks	Credit
I	CND 101	NUTRITIONAL PHYSIOLOGY INCLUDING METABOLISM IN DISEASES	50	4 (3-1-0)
	CND 102	NUTRITIONAL BIOCHEMISTRY AND METHODS OF MODERN INVESTIGATION	50	4 (3-1-0)
	CND 103	NUTRACEUTICALS AND NANOTECHNOLOGY	50	4 (3-1-0)
	CND 104	RESEARCH METHODOLOGY	50	4 (3-1-0)
	CND 195	NUTRITIONAL PHYSIOLOGY AND BIOCHEMISTRY(practical)	50	4 (0-0-8)
	CND 196	BIOMETRIC ASSSSMENT OF NUTRITIONAL STATUS (practical)	50	4 (0-0-8)
	TOTAL		300	24
II	CND 201	STATISTICS AND COMPUTER APPLICATION	50	4 (3-1-0)
	CND 202	PATIENTS COUNSELLING, ENTREPRENEURIAL DEVELOPMENT, NUTRITION EDUCATION & COMMUNICATION	50	4 (3-1-0)
	CND 203	EPIDEMIOLOGY, FAMILY WELFARE AND PUBLIC HEALTH	50	4 (3-1-0)
	C-CND 204	*BASICS OF NUTRITIONAL AND HEALTH (CBCS)*	50	4 (3-1-0)
	CND 295	STATISTICS AND COMPUTER APPLICATION (practical)	50	4 (0-0-8)
	CND 296	PUBLIC HEALTH AND NUTRITIONAL STATUS ASSESSMENT(ASSIGNMENT PROGRAMME) AND REVIEW WORK (practical)	50	4 (0-0-8)
	TOTAL		300	24
III	CND 301	NUTRIGENOMICS AND NUTRIPROTEOMICS AND NUTRIMETABOLOMICS, AND DRUG NUTRIENT INTERACTION	50	4 (3-1-0)
	CND 302	DIETARY MANAGEMENT OF NON-COMMUNICABLE DISEASES	50	4 (3-1-0)
	CND 303	DIETARY MANAGEMENT OF GASTRO-INTESTINAL AND AUTO-IMMUNE DISEASES	50	4 (3-1-0)
	C-CND 304	*FOOD AS MEDICINE AND PREVENTION OF DISEASES(CBCS)*	50	4 (3-1-0)
	CND 395	NUTRITIONAL PROTEOMICS,GENOMICS, AND METABOLOMICS	50	4 (0-0-8
	CND 396	THERAPEUTIC DIET CHART PREPARATION FOR NON-COMMUNICABLE, GASTRO-INTESTINAL AND AUTO-IMMUNE DISEASES	50	4 (0-0-8
	TOTAL		300	24
IV	CND 401	FOOD MICROBIOLOGY AND FOOD PRESERVATION	50	4 (3-1-0)
	CND 402	PEDIATRIC, GERIATRIC NUTRITION AND CRITICAL CARE	50	4 (3-1-0)
	CND 403	DIETARY MANAGEMENT OF INHERITABLE DISEASES, RENAL AND RESPIRATORY DISEASES	50	4 (3-1-0)
	CND 404	FOOD STANDARDS, QUALITY CONTROL AND FOOD FORTIFICATION	50	4 (3-1-0)
	CND 495	THERAPEUTIC DIET CHART PREPARATION FOR INHERITABLE DISEASES, RENAL AND RESPIRATORY DISEASES	50	4 (0-0-8
	CND 496	THESIS WORK AND HOSPITAL TRAINING/ INTERNSHIP (practical, 2 months)	50	4 (0-0-8)
	TOTAL		300	24
	GRAND TOTAL		1200	96

Distinctive Features of the Courses:

		Course code
1.	**Value-added course:**	CND-101, CND-102, CND-103, CND-204, CND-296, CND-301, CND-303, CND-401, CND-404
2.	**Employability:**	CND-296, CND-495, CND-496
3.	**Entrepreneurship:**	CND-202
4.	**Skill development:**	CND-195, CND-196, CND-295, CND-296, CND-395, CND-396, CND-403
5.	**Digital content:**	CND-201
6.	**Ethics:**	CND-104
7.	**Human values:**	CND-203, CND-296, CND-396, CND-304, CND-303, CND-302, CND-402, CND-403
8.	**Environment & sustainability:**	CND-404
9.	**The new course introduced:**	CND-103, CND-203

SEMESTER-I

COURSE STRUCTURE
(ME= Major Exam, IA= Internal Assessment)

COURSE NO.	COURSE TITLES	ME	IA	Total	Credit
CND 101	NUTRITIONAL PHYSIOLOGY INCLUDING METABOLISM IN DISEASES	40	10	50	4
CND 102	NUTRITIONAL BIOCHEMISTRY AND METHODS OF MODERN INVESTIGATION	40	10	50	4
CND 103	NUTRACEUTICALS AND NANOTECHNOLOGY	40	10	50	4
CND 104	RESEARCH METHODOLOGY	40	10	50	4
CND 195	NUTRITIONAL PHYSIOLOGY AND BIOCHEMISTRY (practical)	50	-	50	4
CND 196	BIOMETRIC ASSESSMENT OF NUTRITIONAL STATUS (practical)	50	-	50	4
TOTAL		300			24

Paper: CND 101: Nutritional Physiology including metabolism in diseases

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After completion of the course, the learner will be able to discuss the relationship between nutrition and physiological responses in relation to biomedical mechanisms. They will be also able to learn about the role of nutrients on different physical activities.

Course Content:

Growth and Development, Endocrine & Metabolism, Nutrients & Cardiovascular activities including Pathophysiology, Nutrients & Reproductive Events, Nutrients as Immunomodulators, Nutrients in Endurance & Performance, Bio-energetics & Metabolism in exercise, Hormonal response & Exercise, Body composition & Performance, Review of different energy system for endurance and power activity, nutrition in sports, Cancer, Oncogene and Tumor suppressor gene interaction, Apoptotic & Anti apoptotic factor, Role ofnutrients on its management.

Cellular metabolism covering hormonal signal transduction processes like cAMP, cGMP, DAG, MAP kinase and tyrosine kinase pathways. Genomic and non-genomic processes for cellular metabolic deviation.

Sports nutrition, pre, intra and post sports nutrition, sports drink-types and impact. Glycogen loading. Dietary ergogenic aids. Nutrition on physical performance and endurance.

Paper: CND 102: Nutritional Biochemistry and Methods of Modern Investigation

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After completion of the course, the learner will be able to generate an overview of modern techniques of biological research and its application in the field of nutritional molecular biochemistry.

Course Content:

Carbohydrate metabolism- Glycolysis, Crebs cycle, Neoglucogenesis, Glycogenesis, Glycogenolysis, HMP shunt. Lipid Metabolism- beta oxidation- saturated and unsaturated, omega oxidation, alpha oxidation, fatty acid synthesis. Protein synthesis- steps, post translational modifications, inhibitors of protein synthesis. Cholesterol synthesis and metabolism. Nucleic acid Metabolism, Gene Expression, Enzymes, Free radical, ROS. Enzymes, co-enzymes, cofactors, enzyme action and type of inhibition, Bioenergetics and electron transport chain, Oxidative phosphorylation. Xenobiotics & its Metabolism, Principles of colorimetric, photometric and spectrophotometric devices, Cell study, Chromatography, Electrophoresis, Immunological methods, Techniques used in proteomics and genomic study. PCR, rt-PCR, Real time PCR, Western blot, Flow cytometry, ELISA.

Paper: CND 103: Nutraceuticals and Nanotechnology

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

The learner will be able to develop an idea about modern techniques of effective nutrient targeting with greater bioavailability and beneficial effects of nutraceuticals.

Course Content:

Concept and metabolism of Nutraceuticals with its potential health benefit- definition, types of phytomolecule as nutraceutical. Perspective for food applications for Polyphenols, Phytoestrogens, phytosterols, pigments like lycopene, carcumin. Phytates, Protease inhibitors, amylasae inhibitors, Saponins, Catechin, Resveratrol, DADS. Functional food and nutraceutical concept. Techniques for the separation of nutraceuticals. Prebiotics and probiotics-concept, health beneficial effects.

General concept, Nanotechnology as a tool for the food science. Types of nanoparticles, basic concept of formulation of nanoparticles, Examining biological process relating to metabolism by Nanotechnology due to limitation of sampling tissue, Nanotechnology and sports

supplement, Development of nanoparticles, Nano dietotherapeutics. Nutrient delivery by nano particles- loading and unloading concept.

Paper: CND 104: Research Methodology

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After completion of the course, the learner will be able to impart knowledge about developing skills related to epidemiologic concepts and research methodologies to examine nutritional aspects of health and disease in populations.

Course Content:

Concept of research, Criteria of a good researcher and good research project. Concept of literature review and importance, Hypothesis- types and their importance. Historical Descriptive, Experimental research- model and types, Quasi experimental reserach. Social research, Participatory research, Types of research, Definition & Identification of Research Problem, Probability, Sampling, Simple Random Systematic, Random Sampling, Two stages & multistage sampling, Non-probability sampling purpose, Basic principle of research design, Applied & Action research, Explanatory & descriptive Case study, Longitudinal & Cross Sectional study, Co-relational study, Qualitative research in food and nutrition, Quantitative research method, Research report writing ability enhancement techniques, Research project proposal formulation-criteria and quality enhancement. Importance of PERT chart, Reference writing, types and method. Ethics in research- research ethics committees & their roles and importances. Plagiarism. Concept impact factor, citation, h index, i10 index. Difference among project, dissertation and thesis.

Paper: CND 195 Nutritional Physiology and Biochemistry (Practical)

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

The learner will gain technical competence in basic biochemistry techniques.

Course Content:

Estimation of Plasma protein, Plasma lactate, Serum iron, Serum calcium assessment, Serum triglyceride, Cholesterol Lipoprotein assessment, Estimation of vitamins. Plasma glucose assessment by enzymatic method.

Paper: CND 196: Biometric Assessment of Nutritional Status

Full Marks: 50 Credit: 4

COURSE OUTCOMES: The learner will gather advanced hands on training on anthropometric assessment in laboratory and field.

Course Content:

Weight for age, height for age, weight for height in Pre-adolescence group in different communities and its comparison with reference value. BMI, MUAC, head circumference, chest circumference of different age groups and comments on result. W/H ratio, BMR, Body fat assessment in different zone, skin fold thickness in different age groups, Resting energy expenditure from height, weight and others parameters. Use of Laboratory data and its application on its nutritional status assessment. Nutritional status assessment of preschool going children using growth curve.

SEMESTER-II

COURSE STRUCTURE
(ME= Major Exam, IA= Internal Assessment)

COURSE NO.	COURSE TITLES	ME	IA	Total	Credit
CND 201	STATISTICS AND COMPUTER APPLICATION	40	10	50	4
CND 202	PATIENTS COUNSELLING, ENTREPRENEURIAL DEVELOPMENT, NUTRITION EDUCATION & COMMUNICATION	40	10	50	4
CND 203	EPIDEMIOLOGY, FAMILY WELFARE AND PUBLIC HEALTH	40	10	50	4
C-CND 204	*BASICS OF NUTRITIONAL AND HEALTH (CBCS)*	40	10	50	4
CND 295	STATISTICS AND COMPUTER APPLICATION (practical)	50	-	50	4
CND 296	PUBLIC HEALTH AND NUTRITIONAL STATUS ASSESSMENT(ASSIGNMENT PROGRAMME) AND REVIEW WORK (practical)	50	-	50	4
TOTAL		300			24

Paper: CND 201: Statistics and Computer Application

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After completion of the course, the learner will be able to understand basics of statistical measures and applied predictive analysis. They will be managed and analyze their data by using different computer software which will be helpful for organizing their experiment related to nutritional survey and food analysis.

Course Content:

Conceptual understanding of statistical measures, Classification and tabulation, Measurement of central tendency, Frequency distribution, Histogram, Frequency polygon, Binomial distribution, Normal distribution, Parametric and nonparametric tests, Testing of hypothesis, Chi-square test, Goodness of fit, student 't' test, Correlation, Regression and prediction ANOVA, F- test. Sampling and sample size computation for survey program.

Basic computer architecture, Software's-use of MS word, MS EXCEL-Bar diagram, Pie diagram and line diagram, MS power point, Application of SPSS, Use of software for food analysis.

Paper: CND 202: Patients Counselling, Entrepreneurial Development, Nutrition Education & Communication

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After completion of the course the learner will be able to understand the issues different mode of nutrition education, counseling and communication in the community along with an understanding the women's empowerment in the field of food industry.

Course Content:

Importance and relevance of Information, Education and communication (IEC). Concept, type, process and media of communication, Interpersonal group and Mass communication, Family education. Patient education and Patient health, Introduction of counseling, existing trends in counseling services in India, Processes / techniques of counseling, Cognitive and psychoanalytical techniques in counseling, Practical issues involved counseling, counseling of children and adolescents, family, family planning, abortion, geriatric counselling with specific diseases.

Definition,Characteristic, Importance of entrepreneurship in economic devolopement. Steps, Quality of successful entrepreneur, Contents of training programme,Women entrepreneur,Problems measures,taken for the developement of women entrepreneur in India. Concepts of small food sectors, Objectives, Problems, Measures taken for the promotion of SSI, Procedures to strat SSI-market survey, raw material collection,food production,Packing,labelling and marketing.

Relation among data, information and intelligence. Process of data bank generation and information development in nutrition for community health upgradation. Design of nutrition education and methods used in nutrition education. Teaching aids used in nutrition education. Nutrition education technology, computer application in nutrition education. Communication process, components and types, Prerequisites of good communication. Steps in designing a nutrition communication strategy. Approaches of communication for public health for public health nutrition. Nutrition communication methods. Nutrition communication strategies in rural sector- KAP model, role of 'W to W' strategy and 'C to P strategy. Social and behavior change communication (SBCC)-effective communication, Ten principles of SBCC, communication for development (C4D), four axes of communication for development (C4D).

Paper: CND 203: Epidemiology, family welfare and public health

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course, the learner will be able to impart knowledge related to the concept of current and emerging issues and the process of Public Health Nutrition. They will also gain idea about the nutritional management during disaster

Course Content:

History of epidemiology, type of study designs, risk estimation, public health & medical health, branches of public health, perspectives and functions of public health, public health infrastructure in India, environmental health, lobal burden of diseases, determinants of health, ecological model of population health, epidemiological assessment of different infectious diseases, social factors influencing health and illness, health disparity- outcome- inequality, classification & characterization of health behaviour, health care system & national health programs in India, Nos & health sector, research methods & statistical tools. Nutritional epidemiology. Methods adopted in nuitritional epidemiology, Assessment of epidemiological scenario.

Nutritional problems of the community and implication in public health, Life style, hazards of community health and nutritional status, Nutrition policy in India and plan of action, national food and nutrition policy plane of action and programme, Population dynamics, Primary health care of the community, communicable and infectious disease control, Community water and waste management, Community food protection, Immunization schedule, Holistic approach to the management of fitness and health. Nutrition and health care programmes for mother and child,nutritional requirements of the elderly people and dietary management to meet their nutritional needs, Emergencies and disaster management, disaster cycle, Nutritional management of target group in disaster and emergencies Ration system in disaster and different types of nutrition rehabilitation disaster management, nutritional rehabilitation at post disaster period.

Concept of family welfare. Demographic cycle, Demographic transition. Birth rate, Death rate, General fertility rate, Child and family welfare in India. Female foeticide and infacticide. Family welfare and family planning program. Mother child health care system, Important legislation for women's welfare- maternity benefit scheme, for widows, rights of women. Women health and its importance for community and national upgradation.

PAPER: C-CND 204: BASIC NUTRITION AND HEALTH (CBCS)

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course the learner will be able to familiarize with fundamentals of food, nutrients and their relationship to health. This course will be helpful to create awareness about balanced diet, various food groups, recommended dietary allowances and food hygiene.

Course Content:

Introduction to nutrition:

Food as source of nutrients, functions of food, definition of nutrition and health, nutrients & energy, adequate, optimum & good nutrition, malnutrition. Basic five food groups How to use food guide (according to R.D.A.)

Nutrition and fitness:

Interrelationship between nutrition & health

Use of carbohydrate, protein and fat, minerals and vitamins from food sources and its significances.

Role of dietary fibres in human nutrition.

Effect of cooking on the nutritive value and Food sanitation in hygiene.

Paper:CND 295: Statistics and Computer application (Practical)

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course the learner will be able to manage their own data analysis through statistics manually as well as they will acquire a hands on exposure on the use of computer software in data analysis.

Course Content:

Mean,SD and SE computation using statistical software, Bar diagram, Pie diagram, Line diagram construction using MS Excel, Test of significance of the data using, SPSS statistical software, Origin statistical software, Co relation of co efficient and ANOVA using SPSS software, Food analysis and calorific value using then software

Paper: CND 296: Public health and nutritional status assessment (Assignment programme) and Review work

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the assignment work the learner will develop their skills on public health and nutrition surveys as well as they may start their own research problem after the completion of review work.

Course Content:

Assignment work on community nutrition awareness and public health any five assignments.

SEMESTER-III

COURSE STRUCTURE
(ME= Major Exam, IA= Internal Assessment)

COURSE NO.	COURSE TITLES	ME	IA	Total	Credit
CND 301	NUTRIGENOMICS AND NUTRIPROTEOMICS AND NUTRIMETABOLOMICS, AND DRUG NUTRIENT INTERACTION	40	10	50	4
CND 302	DIETARY MANAGEMENT OF NON-COMMUNICABLE DISEASES	40	10	50	4
CND 303	DIETARY MANAGEMENT OF GASTRO-INTESTINAL AND AUTO-IMMUNE DISEASES	40	10	50	4
C-CND 304	*FOOD AS MEDICINE AND PREVENTION OF DISEASES(CBCS)*	40	10	50	4
CND 395	NUTRITIONAL PROTEOMICS,GENOMICS, AND METABOLOMICS	50	-	50	4
CND 396	THERAPEUTIC DIET CHART PREPARATION FOR DISEASES – PART-I & PART-II	50	-	50	4
TOTAL		300			24

Paper: CND 301: Nutrigenomics and nutriproteomics and nutrimetabolomics, and drug nutrient interaction

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course the learner will be able to impart knowledge regarding prevalence, etiology, diagnosis, pathophysiology, drug nutrient interactions, gene – nutrient interactions and medical, nutritional and lifestyle management in different disease conditions. They will also acquire knowledge about the advances and trends in research in disease conditions.

Course Content:

Concept of Nutrient gene interaction. Nutrient and Gene expression with specialreference to vitamin and other macronutrient, Epigenetic effect of nutritional supplement Influence of cholesterol and triglycerides levels of regulation of LDL receptors gene and apolipoprotein gene expression in liver and G.I tract. Nutrient control of lipoprotein lipase gene expression. Basic idea and field of metabolomics, metabolome represent the ingredient of life, Basic idea and field of metabolomics, metabolome represent the ingredient of life, Techniques adopted in the study of proteomics and metabolomics with special reference to role of nutrients. Pharmacodynamic - influence of nutrients, Bioavailability of drug – influence of nutrients, Mechanism of Drug action, Potency, efficacy, agonist, antagonist, Pharmacokinetic of drug – influence of nutrition, effect of nutrient on Pharmacodynamics, Influence of nutrient on Biotransformation, stability of the drug, gastric emptying. Drug and nutrient compete for absorption, Bioavailability of drug – influence of nutrients.

Paper: CND 302: Dietary management of non-communicable diseases

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course, the learner will be able to involve them into the nutritional care process with learning the role of a nutritionist in non-communicable disease management.

Course Content:

Non communicable disease-
Diabetes (Type -I and Type- II)-Epidemiology, pathophysiology, causes & dietary management
Hypertension –Epidemiology, pathophysiology causes & dietary management
Hyperlipidemia-Epidemiology, pathophysiology causes & dietary management
Atherosclerosis-Epidemiology, pathophysiology causes & dietary management
Nutritional anaemia-Epidemiology, pathophysiology causes & dietary management
Cancer-Epidemiology, pathophysiology causes & dietary management
Constipation-Epidemiology, pathophysiology causes & dietary management
Food allergy-Epidemiology, pathophysiology causes & dietary management.

Paper: CND 303: Dietary management of gastro-intestinal and auto-immune diseases

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After completion of the course the learner will be able to generate the role of nutrition in the prevention of all gastrointestinal diseases in acute and chronic stage.

Course Content:

Gastro Intestinal Diseases

Cholera-Epidemiology,Pathophysiology,Cause and dietery management
Diarrhoea-Epidemiology, Pathophysiology, Cause and dietery management
Dysentery-Epidemiology, Pathophysiology, Cause and dietery management
Flatulence- Epidemiology, Pathophysiology, Cause and dietery management
GERD- Epidemiology, Pathophysiology, Cause and dietery management
Junundice-Epidemiology, Pathophysiology, Cause and dietery management
Hepatitis-Epidemiology, Pathophysiology, Cause and dietery management
Ulcer- Epidemiology, Pathophysiology, Cause & dietary management
Irritable Bowel Syndrome-Epidemiology, Pathophysiology, Cause & dietary Management
Colitis- Epidemiology, Pathophysiology, Cause & dietary management

Rheumatic diseases-Epidemiology, Pathophysiology, Cause &dietary management

Osteoarthritis -Epidemiology, Pathophysiology, Cause & dietary management

Lupas arthritomatosis-Epidemiology, Pathophysiology, Cause & dietary management

Paper: C-CND 304: FOOD AS MEDICINE AND PREVENTION OF DISEASES (CBCS)

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course the learner will be able to know about the impact of different lifestyle disorders and healthy food and nutritional practices in its prevention.

Course Content:

Concept of disease- communicable and non-communicable disease, life style disorder. Very basic concept of medicine.
Culture of health and wellness and healthy food. Supplementary and fortified food.
Fast food and junk food culture and its related hazards.Practice of healthy food habit from infancy, Food for common disorders-fever, gastritis, diarrhea, IBS, colitis.
Food for lifestyle disorder-stress and anxiety, obesity, diabetes, hypertension and cardiovascular disorders, renal disorders, asthma, COPD.

Paper: CND 395: Nutritional Proteomics, Genomics and Metalabolomics (Practical)

Full Marks: 50 Credit: 4

COURSE OUTCOMES: After the completion of the course, the learner aquire hands on training on advanced biochemical and molecular techniques that will be helpful for their future research venture.

Course Content:

Western Blot, SDS PAGE, DNA gel electrophoresis, Native gel electrophoresis
PCR, Immunological Techniques
Enzyme kinetics study in UV spectrophotometer

Any one Assignment program of nutrients genomics

Assignment program of Interactive Nutrition
Program on Nutrient-Drug interaction by chronic delivery of antibiotics in animal model through oral route and bio-availability/pharmacodynamics of micronutrients like Ca++, Fe, I, Vit-E, Vit-A, Vit-D, etc.

Assignment program of metabolomics on any of the following-

Fat enriched diet supplied to animal & assessment of glycolytic metabolic pathway by quantification of pyruvate, fumarate, α-ketoglutarate, lactic acid.
Carbohydrate enriched diet supplied to animal and assessment of LDL, HDL, VLDL, Triglyceride, Cholesterol, Ketone bodies.
Protein enriched diet supplied to animal and assessment of Uric acid, Urea, Ammonia, Purine & Creatinine.
Metabolomics analysis of body fluid from patient for disease diagnosis.

Paper: CND 396: Therapeutic diet chart preparation for non-communicable, gastro-intestinal and auto-immune diseases

Full Marks: 50 Credit: 4

COURSE OUTCOMES:
After the completion of the course, the learner will be able to generate skillful dietary strategy for the patients of above diseases.

Course Content:

Non communicable disease

Therapeutic diet chart preparation for Diabetes, case specific
Therapeutic diet chatt preparation for Hypertension, case specific
Therapeutic diet chart preparation for Hyperlipidemia case specific
Therapeutic diet chart preparation for Atherosclerosis, case specific
Therapeutic diet chart preparation for Nutritional anemia, case specific
Therapeutic diet chart preparation for Cancer, case specific
Therapeutic diet chart preparation for Constipation, case specific
Therapeutic diet chart preparation for Food allergy, case specific
Gastro Intestinal Diseases:- Therapeutic diet chart preparation for Cholera, case specificTherapeutic diet chart preparation for Diarrhoea, case specific Therapeutic diet chart preparation for Dysentery,case specificTherapeutic diet chart preparation for Flatulence,case specific Therapeutic diet chart preparation for Jaundice,case specific Therapeutic diet chart preparation for Hepatitis,case specificTherapeutic diet chart preparation for Gastritis,case specific Therapeutic diet chart preparation for Ulcer,case specific Therapeutic diet chart preparation for Irritable Bowl Syndrome,case specific Therapeutic diet chart preparation for Colitis,case specific

Rheumatic diseases Therapeutic diet chart preparation for Arthritis,case specific Therapeutic diet chart preparation for Osteoarthritis,case specificTherapeutic diet chartpreparation for Lupas arthritomatosis,case specific.

SEMESTER-IV

COURSE STRUCTURE

(ME= Major Exam, IA= Internal Assessment)

COURSE NO.	COURSE TITLES	ME	IA	Total	Credit
CND 401	FOOD MICROBIOLOGY AND FOOD PRESERVATION	40	10	50	4
CND 402	PEDIATRIC, GERIATRIC NUTRITION AND CRITICAL CARE	40	10	50	4
CND 403	DIETARY MANAGEMENT OF INHERITABLE DISEASES, RENAL AND RESPIRATORY DISEASES	40	10	50	4
CND 404	FOOD STANDARDS, QUALITY CONTROL AND FOOD FORTIFICATION	40	10	50	4
CND 495	THERAPEUTIC DIET CHART PREPARATION FOR INHERITABLE DISEASES, RENAL AND RESPIRATORY DISEASES (Practical)	50	-	50	4
CND 496	THESIS WORK AND HOSPITAL TRAINING/ INTERNSHIP (practical, 2 months)	50	-	50	4
TOTAL		300			24

Paper: CND 401: Food microbiology and Food preservation

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course, the learner will be able to understand the principles involving food preservation via fermentation processes, the role and significance of microbial inactivation, adaptation and environmental factors and food safety.

Course Content:

Fundamentals of Microbiology

Introduction, Development of microbiology. Bacteria, virus, Yeast, Moulds-morphology, physiology and nutritional multiplication, significance of moulds and common household moulds. Coliform and non-coliform bacteria, destruction of microbes. Food spoilage by microbes, Food borne illness, Role of microbes. Viruses-discovery, morphology, reproduction, bacteriophages, human viral disease, identification and control and viruses in relation to food science. Denaturation of bacteria-Sterilization: Bacteriological examination and purification of water Probiotics and Symbiotics concept, nutrient Vs. non nutrients. Important features of probiotic microorganisms, Health effects of probiotics including mechanism of action, Prebiotics Concept, Physiological effects ofprebiotics, effects on human health and application in risk

reduction of diseases, Perspective for food applications for Dietary fiber, microbiology of milk and dairy products, poultry and meat products, Microbiology of cereals & cereal products and its spoilage & control of microorganism, Preservation methods. Food additives. Principle of Food Spoilage, Food hygiene, Sanitation, HACCP and quality control.

Paper: CND 402: Pediatric, Geriatric Nutrition and Critical Care

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course, the learner will be able to generate their idea about the pediatric and geriatric nutrition and nutritional management during critical care.

Course Content:

Pediatric nutrition assessment-Anthropometric, Biochemical clinical and dietary measurementsMeasuring ,recording and plotting growthNormal nutrition for infants – requirements , importance of breast feeding ,bottle feeding , commercial formulas,weaning foods ,other family foods ,physiology and care of the preterm infant.Nutritional considerations for LBW children and children with development disabilities. Nutrition in childhood; Growth and development; nutrient needs. Assessment of nutritional status of children. Feeding the preschool child, the school-aged child. Childhood obesity; Underweight and Undernutrition-shottern and long term consequences in brief, Failure to thrive; Growth faltering and detection Mineral and vitamin deficiencies, Dental caries, Allergies, Attention-deficit hyperactivity disorder **Nurological disease in children i.e. epilepsy (ketogenic diets) Pulmonary disease in children, cystic fibrosis 8. Geriatric Nutrition** The ageing process-physiological, metabolic, body consumption changes and impact on health and nutritional status **Socio-psychological aspects of ageing-special problems of elderly women and nutritional factors.** Policies and programmes of the government and NGO sector pertaining of the elderly Critical care.

Nutritional screening and nutritional status assessment of the critically ill Nutritional support system and other life - saving measures for the critically ill Enteral and parenteral nutrition support. Role of immune enhancer, conditionally essential nutrients, Immune suppressants, and special diets in critical care. Complications of nutritional support

system including re-feeding syndrome and rehabilitation diets. **Enteral nutrition, Total parental nutrition**

Paper: CND 403: Dietary management of inheritable diseases, renal and respiratory diseases

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After completion of the course, the learner will be able to generate knowledge about the pathophysiology of inheritable, renal and respiratory diseases and their subsequent nutritional management.

Course Content:

Inborn error of metabolism-Epidemiology, Pathophysiology, Cause and dietery management and critical care

HIV-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Sepsis- Epidemiology, Pathophysiology, Cause and dietery management and critical care

Trauma- Epidemiology, Pathophysiology, Cause and dietery management and critical care

Burns- Epidemiology, Pathophysiology, Cause and dietery management and critical care Phenyl Ketonuria-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Galactosemia-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Glycogen storage disease-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Maple syrup urine disease-Epidemiology, Pathophysiology, Cause & dietary management and critical care.

Parkinson disease-Epidemiology, Pathophysiology, Cause & dietary management and critical care

Alzeimer's disease-Epidemiology, Pathophysiology, Cause & dietary management and critical care

Huntington Corea disease-Epidemiology, Pathophysiology, Cause & dietary management and critical care.

Renal disease

Nephritis -Epidemiology, Pathophysiology, Cause and dietery management and critical care

Glomerulitis-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Renal failure -Epidemiology, Pathophysiology, Cause and dietery management and critical care

Kidney stone- Epidemiology, Pathophysiology, Cause and dietery management and critical care

Nephrolithiasis-Epidemiology, Pathophysiology, Cause and dietery management and critical care.

Respiratory disease

Asthama- Epidemiology, Pathophysiology, Cause and dietery management and critical care-

Chronic obstructive pulmonary disease-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Respiratory failure-Epidemiology, Pathophysiology, Cause & dietary management and critical care

Tuberculosis-Epidemiology, Pathophysiology, Cause & dietary management and critical care

Paper: CND 404: Food standards, quality control and food fortification

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course, the learner will be able to develop knowledge about the nature of disease and nutritional care process of the above diseased patients.

Course Content:

FOOD STANDARD AND QUALITY CONTROL

Principles of quality control - Raw material process control and Product inspection. Standards for foods - Milk and milk products, Fruits and Vegetables, Beverages and Fleshy foods. Food Laws, Consumerism - Definition, Consumer protection, Consumer Education, Legal modes of protection and Machinery for redressal of consumer grievances.

EVALUATION OF QUALITY OF FOODS

Sensory Evaluation of foods - Requirement for conducting sensory tests, Types of test, limitation of sensory evaluation. Objective methods of evaluation of food. Improvised instruments used for Indian recipes.

FOOD LAWS

Concept and meaning of Food quality and food Safety, food adulteration, food hazards. Natural toxins.

Food laws and regulations – National and international food laws, Governing bodies. Exposure, estimation, toxicological requirements and risk assessment. Safety aspects of water and beverages such as soft drinks, tea, coffee, cocoa. Safety assessment of food contaminants and pesticide residues. Safety evaluation of heat treatments and related processing techniques.

Genetically modified foods

GM food- concept, Definition, available GM foods in India. Fundamental techniques for GM food preparation

Food fortification through genetical modification .Steps adopted for acceptability of GM food.

Food Fortification:

Needs, objectives, principles and rationale, selection and basis of fortificants. Fortifying products: Malting and germination of grains – process, characteristics, nutritional benefits and uses Fortifying beverages, candies, snack products.

Salt, Sugar, Oils and other health foods fortification

Food Toxicology

Sources of hazardous substances in Food-Mycotoxin, Natural Toxin, Environmental Toxin, Industrial toxin, Agricultural Toxin, Adulterants. Principles of Toxicology Classification of toxic agents; characteristics of exposure; spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity. Evaluation of toxicity: Risk vs. benefit: Experimental design and evaluation: Prospective and retrospective studies: Controls: Statistics (descriptive, inferential): Animal models as predictors of human toxicity: Legal requirements and specific screening methods: LD50, ED50 and TD50: In vitro and in vitro studies; Clinical trials.

Natural Toxins in Food: Natural toxins of importance in food- Toxins of plant and animal origin; Microbial toxins (e.g. Algal toxins, bacterial toxins and fungal toxins). Natural occurrence, toxicity and significance. Food poisoning; Mycotoxicosis of significance. Determination of toxicants in foods and their management, Sea food toxin- PSP, DSP

Food Additives and toxicants added or formed during Food Processing: Safety of food additives; toxicological evaluation of food additives; food processing generated toxicants: nitroso compounds, heterocyclic amines, Dietary Supplements and Toxicity related to Dose: Common dietary supplements; relevance of the dose; possible toxic effects.

Paper: CND 495: Therapeutic diet chart preparation for inheritable diseases, renal and respiratory diseases (practical)

Full Marks: 50 Credit: 4

COURSE OUTCOMES:

After the completion of the course, the learner will be able to develop hands on training on the dietary therapy of the patients with HIV, trauma, inborn error of metabolism, different renal and respiratory disorder.

Course Content:

Inborn error of metabolism-Epidemiology, Pathophysiology, Cause and dietery management and critical care

HIV-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Sepsis- Epidemiology, Pathophysiology, Cause and dietery management and critical care

Trauma- Epidemiology, Pathophysiology, Cause and dietery management and critical care

Burns- Epidemiology, Pathophysiology, Cause and dietery management and critical care Phenyl Ketonuria-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Galactosemia-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Glycogen storage disease-Epidemiology, Pathophysiology, Cause and dietery management and critical care

Maple syrup urine disease-Epidemiology, Pathophysiology, Cause & dietary management and critical care.

Parkinson disease-Epidemiology, Pathophysiology, Cause & dietary management and critical care

Alzeimer's disease-Epidemiology, Pathophysiology, Cause & dietary management and critical care

Huntington Corea disease-Epidemiology, Pathophysiology, Cause & dietary management and critical care

Renal disease

Therapeutic diet chart preparation for Nephritis, case specific

Therapeutic diet chart preparation for Glomerulitis, case specific

Therapeutic diet chart preparation for Renal failure, case specific

Therapeutic diet chart preparation for Kidny stone , case specific

Therapeutic diet chart preparation for Nephrolithiasis, case specific

Respiratory disease

Therapeutic diet chart preparation for Asthama/Chronic obstructive pulmonary diseasecase specific

Therapeutic diet chart preparation for Respiratory failure, case specific

Therapeutic diet chart preparation for Tuberculosis, case specific

Therapeutic diet chart preparation for Inborn error of metabolism, case specific

i. Therapeutic diet chart preparation for Phenyl ketonuria, case specific

ii. Therapeutic diet chart preparation for Galactosemia, case specific.

iii. Therapeutic diet chart preparation for Glycogen storage disease, case specific

iv. Therapeutic diet chart preparation for Maple syrup urine disease, case specific

Therapeutic diet chart preparation for HIV, case specific

Therapeutic diet chart preparation for Sepsis, case specific

Therapeutic diet chart preparation for Trauma, case specific

Therapeutic diet chart preparation for Bums, case specific

Paper: CND 496: Thesis work and hospital training (2 months)

COURSE OUTCOMES:

After the completion of the course, the learner will get hands on exposure in hospital environment to assess patients dietary requirements and management. They may also develop their own research problem in future from developing their thesis work in this semester.

Course Content:

1. General outline about how to conduct research work on a particular topic and an idea about how to perform hospital training).