

DAVANGERE UNIVERSITY



Department of Studies in Biochemistry

**Program under Skill Based Education
under National Skills Qualifications Framework
NSQF LEVEL-8**

Syllabus for

Post Graduate Diploma (PGD) in “Clinical Dietics and Applied Nutrition”

Semester I and Semester II (one Year program)
Under
Credit based Semester and Grading system
Effective from Academic year 2020-21

**Department Studies in Biochemistry
Davangere University, Shivagangothri,
Davangere-577007**

DAVANGERE UNIVERSITY



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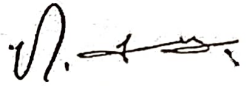
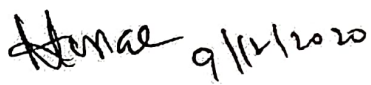
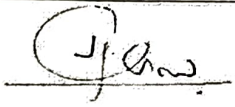
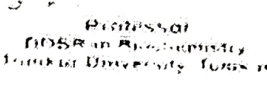
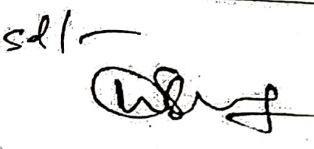
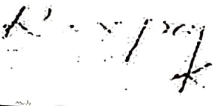
Date: 10-11-2020.
29-11-2020.


Proceedings of Board of Studies (B.O.S.) meeting of P.G. Biochemistry Board Davangere University (2020-21)

Board of Studies (B.O.S.) meeting of P.G. & U.G. Biochemistry board of Davangere University was held in the Department of Biochemistry, Davangere University, Shivagangothri, on 10-11-2020 (Tuesday) at 11.00 a.m. (outstation members on the board attended through Zoom App online platform). Dr. Vadlapudi Kumar, Chairman, B.O.S. welcomed the board members to the meeting. The chairman of the board briefed the agenda to board for deliberations. The board has thoroughly discussed about each point/item in detail. Proceedings have been recorded and provided as hereunder.

- The board has approved the revised and updated P.G. Biochemistry syllabus which has been included with 02 more interdisciplinary-elective papers (BC 3.5B: Biochemistry and Nutritional Health; BC 3.5C: Biochemical Techniques; BC 3.5D: Enzymes - Biocatalysts in addition to one interdisciplinary-elective paper (BC 3.5A: Clinical Biochemistry) already there in the previously approved syllabus.
- The board has given approval for the course structure, syllabus, eligibility criteria and fee structure for P.G. Diploma in Clinical Dietics and Applied Nutrition course that has been approved by UGC-NSQF, and the course is proposed to start from the academic year 2020-21.
- The board has given approval for the panels of examiners for U.G. Biochemistry, P.G. Diploma in Clinical Dietics and Applied Nutrition, and M.Sc. Biochemistry courses (2020-21).
- The board has considered the requests and approved for granting the extension time for Thesis submission by Ph.D. candidate (2013-14 batch) Mr. Rajashekhhar J.
- The board has considered the request of Dr. Pramod S.N., Associate Professor for the transfer his Ph.D. guideship from Department of Food Technology to Department of Biochemistry.
- The board has considered the request of Dr. Poornima D.V. Assistant Professor and given approval to accord the recognition to her as research guide in Biochemistry of Davangere University as per the regulations/norms of Davangere University.
- The board has considered the request of the Department and given approval for establishing Memoranda of Understandings (MoUs) with reputed Universities, Institutions, Research Organizations, Industries and Hospitals within the State, from India and abroad, through Department of Biochemistry, Davangere University. As these MoUs are necessary for P.G. Diploma in Clinical Dietics and Applied Nutrition Course, Academic and Research Collaborations.

(Contd..... in Page 2)

Chairman and Members in the Board of Studies		Signature
Prof. Vadlapudi Kumar	Chairman	
Prof. Gopal M Advirao	Internal Member	 9/12/2020
Prof. G.J. Sathisha	External Member (P.G.)	
Prof. K.S. Girish	External Member (P.G.)	 Professor DGSB in Biochemistry Tamil Nadu University, Tirunelveli
Dr. Santoshkumar M.	Internal Member (P.G.)	
Mrs. Roopa K.	Internal Member (U.G.) (Out station; GSC, Chitradurga)	


 (Dr. VADLAPUDI KUMAR)
 Chairman B.O.S.
 Department of Biochemistry
 Davangere University
 Shivagangothri, Davangere-577007

Preamble

Nutritionists and dieticians are health professionals, these two supports our health care system and provide extensive contribution to the medical interventions to manage disease of patients through dietary guidelines. In present diet and lifestyle are two important part of maintaining healthy life styles. Teaching patients about healthy eating is a primary duty, as well as staying aware of developments in medicine and nutrition is the need of the day. However, there is a difference between dietetics and nutrition: dietetics focuses on food management, whereas nutrition focuses on the promotion of health through healthy food through nutrition studies. Nutrients or valuable food elements which are the essential for the sustenance, maintenance and of growth of the human body. Since the food elements are the primary source of the nutrients in human diet, acquires central importance in human health. The absence of proper nutrition in diet is termed malnutrition. Malnutrition is known to seriously impair health and development of mental and physical attributes. Hence Nutrition also explores the link of diseases and health issues, food allergies and intolerances with Nutrients. Nutritionists usually work in a research setting involving scientific aspects of food science or biochemistry.

Dietetics is scientific study of the human diet in perspective of Nutrition. In modern healthcare diet has become important for the individual and community in equal measure. The changing food pattern and erratic food habits have enhanced the role of nutritionists and dieticians. They plan healthy diets and corrective diet therapy considering the health age and food habits of individuals. They are also entrusted with the responsibility to educate the general public about right diet for appropriate nutrition.

The Post Graduate Diploma in Clinical Dietetics and Applied Nutrition is designed to impart advanced knowledge and skills that is life oriented, career and community oriented. It has special relevance to industry and hospital application with the help of weekly field work, rural camp of seven days and hospital internship programme.

Scope and Highlights

The society is becoming health conscious. The increased access to information has brought a level of awareness among the general population. This offers a great opportunity for the health care professionals specializing in Dietics and nutrition. Moreover they can play a pivotal role in managing food habits for the aging and the young. Armed with a PG diploma, a student can earn further specialization in fields like clinical nutrition, public health nutrition,

sports nutrition/Dietics, food science/technology, Generic nutrition. They can also pursue MPhil and PhD studies to seek opening in academia and research.

The curriculum focuses on a number of core subjects such as human physiology, clinical Biochemistry, Medical nutrition therapy, personnel management, Hospital organization, food services, clinical nutrition, Dietetic techniques and Generic nutrition. It allows jobs in Public Health Center, Clinical Dietetics, Food Service Management, Fitness Center and many more. In the public sector work can be found with government community health programmes, hospitals, health department, factories, colleges, schools and departmental cafeterias.

The private sector offers a vast scope for employment. Work can be found with Gyms, sports hostels, athlete camps, Slimming Centers, Health clubs, canteens and nursing care. The field of catering in restaurants and star hotels is also a good source of jobs. A number of opportunities exist in Teaching and Research in research institutes, universities, hospitals and FMCG companies. Mass Media instruments such as health TV shows and internet portals on health sciences also offer good avenues of employment. A number of job profiles are available such as Private Consultant, Clinical Dietitians, Community Dietitians, Management Dietitians and Consultant Dietitians.

Objectives of the course:

To develop the capabilities and inputting knowledge of students in the areas of Physiology Basic, Clinical and Applied Nutrition Clinical Testing and Food Analysis, Foods and Dietetics, Diet Therapy, Food Service Management and Public Health

To acquire relevant skills required to develop students to become efficient professionals in academics, healthcare institutions, food and biotech industry professional and community service.

Eligibility

A candidate for being eligible for admission to the Post Graduate Diploma in Clinical Dietetics & Applied Nutrition must have taken either:

- a) B Voc in Nutrition, health science, hospital management, Bachelor of Science (Home Science) general or with specialization in Food science and Nutrition
- b) Bachelor of Science in Microbiology/Bio-chemistry/Biotechnology/Food technology
- c) Bachelor of Science in Life Sciences with a combination of the above subjects with Chemistry

- d) Graduate degree relevant to food science and nutrition, like BSc (AG), BE Biochemical engineering. Food processing, Graduate equivalent degree in Paramedical courses, and medicine and nursing.
- e) Bachelor of nursing of this University or a Degree of another University recognized as equivalent thereto.

Fee structure: As per the guidelines of NSQF Level-8 and order of government and university

Duration of the Course and course completion:

The duration of the Diploma Course shall be one year and there shall be a University Examination at the end of the course. The Diploma in Clinical Dietetics and Applied Nutrition shall not be conferred upon a candidate unless he has passed in all subjects, practicals and in field work including internship.

Though the duration of the PG diploma course is one year or 2 semesters, as per the NSQF Level 8 guidelines. There is a possibility for the exit of student after 1 semester with a certification course. The student who successfully completes one semester can exit from the course with a Post graduate certificate awarded to him as per NSQF guidelines.

Skills learned during the course

The enrolled students after completion of the course will be more organized and will have enhanced skills required for food and biotech industries and will also exhibit marketing, team work with hospital management qualities. The students also made self sustainable to start their own entrepreneurship and diet counseling centers. They will have exhibited skills like,

- Organizational abilities
- Teamwork
- Aptitude for Science
- A Keen interest in health and diet
- Understanding of people from varied backgrounds

Common tasks of nutritionist or dietician include:

- Scientific study of nutrition and food science
- Provide guidance on eating habits and nutrition to people
- Plan diets according to the needs of patient/client
- Conduct or take part in research activity (depending upon qualification)

Some of the well known recruiters

The main recruiters for the PG diploma in Clinical Dietetics and applied nutrition are belongs to all the sectors of the societies, they have opportunities in both government and private sectors.

To mention some of them are:

In Government sector include-

- Government hospitals
- Community health centres
- Government Schemes and Missions (like ICDS, NHRM etc)
- Government Organizations (like FNB, ICMR, Public Health Foundation etc)
- Government R&D units
- Government Nursing homes
- Government Nutrition Education Institutes

In private sector include-

- Private clinics and hospitals
- Nursing homes
- NGOs
- Food products manufacturing firms
- Pharmaceutical firms
- Private R&D units
- Private Nutrition Education Institutes
- Health Clubs
- Fitness Centres
- Sports Centres and Franchises
- Hotels

Job Positions

The skilled professionals after graduating PG diploma in Clinical Dietetics and applied nutrition will have wide opportunity to find jobs in health care institutions, hospitals, food industries at various levels of positions.

- Consultant
- Food show host
- Sports Nutritionist
- Nutrition Trainer
- Public Health/Community Dietitian

Programme Name:

NSQF Level-8: Postgraduate Diploma (PGD) in “Clinical Dietics and Applied Nutrition (CDAN)” from Academic year 2020-21

Course structure for the Programme PGD in CDAN

Semester	Course Component	Subject/Paper Code	Title of the paper	Instruction Hrs/Week	Marks			Credits	Examination duration (Hrs)
					Examination	Internal assessment	Total marks		
Course structure for SEMESTE-I									
SEMESTER - I	General Component	CDAN 1.1	Food Science and Nutritional components-Theory	4	70	30	100	4	3
		CDAN 1.2	Communication skills, Environmental studies and Biostatistics	4	70	30	100	4	3
		CDAN 1.3	Food Science and Nutrition -Practicals	4	40	10	50	2	3
		CDAN 1.4	Biochemical Methods for Food Analysis -Practicals	4	40	10	50	2	3
	Skill Component	CDAN 1.5	Biochemical Methods for Food Analysis-Theory	4	70	30	100	4	3
		CDAN 1.6	Human Physiology and Nutrition through Life Cycle	4	70	30	100	4	3
		CDAN 1.7	Food Toxicology and Immunology	4	70	30	100	4	3
		CDAN 1.8	Nutrition and Food service Field Work	6	70	30	100	6	3
Total credits for the Semester - I				34	--	--	700	30	--
Course structure for SEMESTE-II									
SEMESTER - II	General Component	CDAN 2.1	Functional foods and Nutritive Dietics -Theory	4	70	30	100	4	3
		CDAN 2.2	Clinical Biochemistry and Diet therapy -Theory	4	70	30	100	4	3
		CDAN 2.3	Functional foods and Nutritive Dietics -Practicals	4	40	10	50	2	3
		CDAN 2.4	Clinical Biochemistry and Diet therapy -Practicals	4	40	10	50	2	3
	Skill Component	CDAN 2.5	Food safety laws, regulations and hospital management	4	70	30	100	4	3
		CDAN 2.6	Diet formulations, Public health and Dietics	4	70	30	100	4	3
		CDAN 2.7	Nutrogenomics and bioinformatics	4	70	30	100	4	3
		CDAN 2.8	Hospital internship and Food industry internship	6	70	30	100	6	3
Total credits for the Semester - II				34	--	--	700	30	--

Department of Studies in Biochemistry
Subject: BIOCHEMISTRY
“P.G Diploma in Clinical Dietics and Applied Nutrition”
Courses having focus on Employability/Entrepreneurship/Skill Development
2020-21 Syllabus

Course Code	Title of the Paper	Activities with direct bearing on Employability/Entrepreneurship/Skill Development
CDAN 1.5	Biochemical Methods for Food Analysis	Skill development/Employability: Biochemical calculations, separation and isolation methods for food analysis. Technical Assistant/Associate/ Officer in Quality Control Officer in Pharma Industry/ Clinical Diagnosis Laboratory/ Food and Beverages Industry/Cold Storage/ Health and Wellness Industry.
CDAN 1.8	Nutrition and Food service Field Work	Employability and Entrepreneurship: Internship in hospitals or Food Service Institutions & Hospitals /Clinics. Entrepreneur of Clinical Diagnosis kits development/Food Industry and Beverages Industry. Wellness advisor, Diet and nutrition advisor. Food Safety Officer.
CDAN 2.2	Clinical Biochemistry and Diet therapy	Employability and Entrepreneurship: Internship in hospitals or Food Service Institutions & Hospitals /Clinics. Entrepreneur of Clinical Diagnosis kits development/Food Industry and Beverages Industry. Wellness advisor, Diet and nutrition advisor.
CDAN 2.7	Nutrigenomics and bioinformatics	Skill development/Employability: Influence of molecules of food and nutrition on gene expression. Application of Bioinformatics tools for molecular interaction. Technical Assistant/Associate/ Officer in Quality Control Officer in Pharma Industry/ Clinical Diagnosis Laboratory Food Safety Officer. Associate Nutritionist or Dietician.
CDAN 2.8	Hospital internship and Food industry internship	Employability and Entrepreneurship: Internship in hospitals or Food Service Institutions & Hospitals /Clinics. Technical Associate/ Officer in Clinical Diagnosis Laboratory/Food and Beverages Industry. Entrepreneur of Clinical Diagnosis kits development/Food Industry and Beverages Industry. Wellness advisor, Diet and nutrition advisor.
CDAN 1.4	Biochemical Methods for Food Analysis - Practicals	Skill development/Employability: Development of analytical skills helps for and Technical Associate/ Officer in Clinical Diagnosis Laboratory/Food and Beverages Industry.
CDAN 1.8	Nutrition and Food service Field Work	Employability and Entrepreneurship: Wellness advisor, Diet and nutrition advisor. Food Safety Officer. Associate Nutritionist or Dietician.
CDAN 2.4	Clinical Biochemistry and Diet therapy - Practicals	Employability: Practical skills helps Officer in Clinical Diagnosis Laboratory,
CDAN 2.7	Nutrogenomics and bioinformatics	Skill development & Employability in hospitals or Food Service Institutions & Hospitals /Clinics
CDAN 2.8	Hospital internship and Food industry internship	Employability Entrepreneurship in hospitals or Food Service Institutions & Hospitals /Clinics

I SEMESTER COURSES

General component -12 Credits

Skill Components -18 Credits

Total credits acquired on completion of course= 30

The student completing the first semester will be awarded with

“Certificate in Clinical Nutrition”

PGD-CDAN 1.1: Food Science and Nutritional components-Theory

Credits: 4

Total Hrs: 60

Pre requisite; The student should be knowledgeable about chemistry and the different types of food.

Objectives:

To acquaint students with the chemical constituents of food, their interactions during cooking, and evaluation of taste characteristics of food

To familiarize students with the classification of foods and nutrients, and their biological and nutritional importance in the human body

UNIT-I

Food Sources: Properties and nutritional value of foods. Primary, secondary and tertiary processing. Effects of processing on components, **Wheat, Rice and Millets:** Structure, composition, primary processing, functionality in food system, **Legume:-**Types, composition, milling, germination, cooking & processed products. **Fruits and vegetables:** Composition, pectins, plant acids, types of pigments, effect of cooking on colour and texture of vegetables. **Fats and oils:** Properties, manufacture, uses in food systems. Rancidity- types, mechanism and prevention. Use of oilseeds and oilseed meals. **Milk and egg products:** Composition, functionality in food system, processing of different products.

15 Hrs

UNIT-II

Flesh foods: Types, composition, structure of muscle, Meatphysico - chemical changes, cooking and processing. **Sugar and Jaggery and Ready to serve beverages:** Principals Indian traditional sweet preparations. Brief manufacturing process of coffee, tea, cocoa, alcoholic beverages (fruit wines). **Introduction:** Concept of Nutrition, Relation of nutrition to health, Adequate nutrition, optimum nutrition and malnutrition, The emergence, scope and methodology of Nutrition as a Science Energy Metabolism: Physiology, fuel value, Direct and Indirect Calorimetry, Basal and Resting metabolism, Total energy requirement and its modification under normal physiological and other stress conditions.

15 Hrs

UNIT-III

Carbohydrates: Classification and functions. Digestion, Absorption, transport, storage and utilization. Clinical and nutritional significance of carbohydrates. Classification of dietary fibre and its clinical significance. **Lipids:** Classification and functions, Digestion, absorption, transport, utilization and storage. Role of essential fatty acids, PUFAs, MUFAs, Clinical and Nutritional significance. **Proteins:** Classifications of amino acids and proteins, Review of digestion, absorption, transport and utilization, Evaluation of protein quality by assessment of digestability coefficient, biological value, protein efficiency ratio, NDP cal. Percent and Net Protein utilization. Supplementary value of proteins. Sources, recommended allowances and deficiency diseases Amino acid toxicity and imbalance.

15 Hrs

UNIT –IV

Vitamins: Physiological and biochemical role of fat and water soluble vitamins, sources, absorption, transport, utilization, disposal and storage. Requirements and recommended allowances under normal and stress conditions. Effects of deficiency and excess.

Minerals: Classification of macro and micro nutrients along with their physiological and biochemical role. Absorption, utilization and distribution in the body. Food sources and recommended allowances. Effects of deficiency and excess in the diet.

Fluid and electrolyte balance: Total body water as well as content of intracellular and extracellular fluid Water loss and balance, water intoxication, Interrelationship of body fluids.

Acid base balance – Body water and functions of water: Distribution of body water, Water balance and elimination.

Electrolytes: their functions, absorption, excretion, recommended intake and sources. Interrelationships between nutrients Protein and energy.

15 Hrs

Learning outcome:

The student will be able to relate the food sources and macronutrients to function in the body. The student will gain an understanding of macro- and micronutrient food sources and their functional importance in the human body.

References:

1. Srilakshmi, B. 2005. Food Science, New Age International (P) Ltd., Publishers, New Delhi.
2. Potter, N. and Hotch Kiss, J.H. (1996): Food Science, Fifth edition, CBS Publishers and Distributors, New Delhi
3. Julians, B.O. (1985). Rice Chemistry and Technology, 2nd edition, American Association Chemists, St. Paul Mimesota, USA.
4. Charley, H. (1982). Food Science, 2nd edition, John Wiley & Sons, New York.
5. Arthey, D. and Ashurst, P.R. (1996). Fruit Processing, Blackie Academic & Professional, London
6. Desrosier, N.W. and James N. (2007). Technology of food preservation. AVI Publishers.
7. Meyer, L.H. 1974. Food Chemistry, AVI Publishing Co. Inc, 8. Manay, S. and Shadaksharamasamy, Food: Facts and Principles, New Age International (P) Publishers, New Delhi.
8. Srilakshmi (2008). Nutrition Science. New Age International Pvt. Ltd, New Delhi.
9. Mahan L K and Escott – Stump S (2000). Krause's Food Nutrition and Diet Therapy 10th Ed WB Saunders Ltd
10. 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.

PGD-CDAN 1.2: Communication skills, Environmental studies and Biostatistics

Credits: 4

Total Hrs: 60

Pre requisite; The student should be knowledgeable about basic English writing and reading and studied environmental basics at undergraduate level

Objectives:

To acquaint students with the basic communication skills and make fluent in English writing and speaking.

To create environmental awareness and make the student to learn the significance of environment protection and its importance for sustainable growth and development.

To make the student learn basics of bioinformatics and its application in nutrition and dietetics during food formulation and food research studies.

UNIT-I

Communication skills: The concept of communication – process and barriers, **Reading (English):** i. Types of reading (skimming and scanning). ii. Types of reading (same with examples Newspaper / Magazine article, TV, feature and documentary, radio bulletins, advertising copy, press release in English) iii. Recognizing aspects of language particularly in media. Vocabulary 100 media words. **Grammatical structure** – spelling, structure of sentences, Active / Passive voice, tenses. **Writing (English)** Letter Writing – Application Letter, Resume, Personnel Correspondence, Informal, Paragraph writing. Introduction to feature and script writing. **Oral Communication** – presentation, anchoring, viva voce, interview, public speaking, skits/ plays, panel discussions, voice over, elocution, debates and group discussion 5 - Thinking and Listening Skills – Types of thinking (rational and logical), Errors. Types of listening, Barriers to listening.

15 Hrs

UNIT-II

Environmental studies: Definition, scope and importance, Need for public awareness. Natural resources: Renewable and non-renewable resources. Natural resources and associated problems - Use and exploitation, environmental effects, Forest resources. Water resources, Mineral resources, Food resources, Land resources and Energy resources Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. **Ecosystems** –Concept, structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. **Biodiversity:** Introduction – Definition : genetic, species and ecosystem diversity. Biogeographical classification of India, hot spot. Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.

15 Hrs

UNIT-III

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management : Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation- rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics : Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Population explosion – Family Welfare Programme. Environment and human health- Human Rights. Value Education. HIV/AIDS. • Women and Child Welfare. Role of Information Technology in Environment and human health.

UNIT-IV

Biostatistics: Importance and Scope of Statistics, Data Types, Frequency Distribution, Graphical Representation Methods (Histogram, Bar Charts, Pie Charts), Measures of Center Tendency (Mean, Median, Mode,) and Dispersion (Standard Deviation, Variance) Advantages and Disadvantages, Co-Efficient of Variance. Collection of Data, Census Method, Concept of Population, Sample, Sampling, Sample Size, Sampling Error, Advantages and Disadvantages of Sampling Method, Necessity of Sampling, Types of Sampling Methods, Types of Random Sampling Methods. Statistical Hypotheses-Null and Alternative, Level of Significance, Power of the Test, P Value, Degrees of Freedom, Chi-Square Test. Simple Linear Regression, Multiple Linear Regression (Definition, Assumptions, Applications, and Examples), Analysis of Variance –ANOVA, Assumption, Test of ANOVA, Types of ANOVA, Construction of One Way Analysis of Variance.

Learning outcome:

The student will be able to write and communicate in English and will justify the study of environment and appreciate its importance in sustainable growth of nation. The student will able to apply statistical tools effectively in diet formulation and food based research studies.

References:

1. Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.
2. Ajmani, J. C. Good English: Getting it Right. New Delhi: Rupa Publications, 2012.
3. Amos, Julie-Ann. Handling Tough Job Interviews. Mumbai: Jaico Publishing, 2004.
4. Bonet, Diana. The Business of Listening: Third Edition. New Delhi: Viva Books, 2004.
5. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
6. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India,
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
9. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
10. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p p) Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
11. Practical statistics for experimental biologist - Wardlaw, A.C, John Wiley and Sons (1985).
- 12.. Statistical methods in biology – Norman T. J. Bailey, Cambridge University Press (2012).
13. Biostatistics – W Daniel, John Wiley & Sons; 7th Revised edition (2004).

PGD-CDAN 1.3: Food Science and Nutrition – Practicals

Credits: 2

Total Hrs: 60

Pre requisite; The student should be knowledgeable about chemistry or Biochemistry basic practical skills.

Objectives:

To acquaint students with the chemical constituents of food, to understand the practical skills to measure the food constituents.

To familiarize students with the classification of foods and nutrients, and isolation of them for biological and nutritional evaluations.

1. Study of preparation variables and quality factors of products from the following food commodities (Wet milling of food samples, Dry milling of food samples)-
 - a. Wheat, Rice and millets, Legumes and Vegetables
2. **Isolation methods (any four)**
 - b. starch from potato
 - c. Casein from milk
 - d. Oil from oil seeds
 - e. DNA from onion leaves, coconut endosperm
 - f. Caffeine and tannin from Tea leaves
 - g. Citric acid from lemon juice
3. **Qualitative analysis of macronutrients in food sources:**
 - h. Carbohydrates- general reactions of carbohydrates and schematic analysis
Glucose, fructose, maltose, lactose, sucrose, and starch.
 - i. Amino acids and Proteins- general reactions and schematic analysis
Arginine, tyrosine, tryptophan and proline- Albumin and Casein
 - j. Lipids- animal fats and Vegetable oils
 - k. Detection of food adulterants (dairy products, oils, spices and pulses)
 - l. Qualitative analysis of Na and K content of certain foods using flame photometry
4. Study on the Characteristic features of food components that impact nutrition
 - m. Fats and oils**
 - Determination of smoking point
 - Determination of ideal temperature for frying and frying quality of oil and fats
 - Analysis of fresh and used oils and measuring oil uptake in deep fried foods
 - n. Milk and egg**
 - Studying the taste profile and consistency of egg and change in properties.
 - Studying the textural characteristics of curds prepared using different milk (cow, buffalo and dairy milk)
 - Determining the storage stability of eggs stored at – room temperature, refrigerated temperature and fresh eggs
 - Factors affecting ferrous sulphide formation in boiled eggs
 - o. Sugar and jaggery**
 - Demonstrate stages of sugar and jaggery cookery

-Determine the effect of adding other ingredients on the stages of sugar and jaggery cookery

p. Flesh foods

- Demonstrate the different methods of storage and change in physical characteristics and nutrition quality after frying, boiling, grilling and baking) on chicken, fish and meat.

Learning outcome:

The student will be able to relate the food sources and macronutrients to function in the body. The student will gain experimental skills to isolate food components and evaluate their variability of nutrition factors on food processing techniques.

References:

1. Srilakshmi, B. 2005. Food Science, New Age International (P) Ltd., Publishers, New Delhi.
2. Potter, N. and Hotch Kiss, J.H. (1996): Food Science, Fifth edition, CBS Publishers and Distributors, New Delhi
3. Julians, B.O. (1985). Rice Chemistry and Technology, 2nd edition, American Association Chemists, St. Paul Mimesota, USA.
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7. Meyer, L.H. 1974. Food Chemistry, AVI Publishing Co. Inc, 8. Manay, S. and Shadaksharamasamy, Food: Facts and Principles, New Age International (P) Publishers, New Delhi.
8. Srilakshmi (2008). Nutrition Science. New Age International Pvt. Ltd, New Delhi.
9. Mahan L K and Escott – Stump S (2000). Krause's Food Nutrition and Diet Therapy 10th Ed WB Saunders Ltd
10. 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.

PGD-CDAN 1.4: Methods for Food Analysis - Practicals

Credits: 2

Total Hrs: 60

Pre requisite; The student should be knowledgeable about chemistry or Biochemistry basic practical skills.

Objectives:

To acquaint students with the food analysis techniques, to understand the practical skills to measure the food constituents.

To familiarize students with the Biochemical techniques used in qualitative and quantitative estimation of food nutrients.

Food sample processing techniques:

1. Preparation of molar, normal, percentage solutions. PPM and PPB content calculations and preparations.
2. Homogenization techniques and comparing the extractability of nutrients from food sources.
3. Salting in and salting out, protein precipitation methods and dialysis.
4. Acidity and alkalinity of foods using pHmeter and strips.
5. Study of change in pH and temperature during processing and storage of selected foods.

Proximate analysis of food sample:

6. Estimation of ash content in different foods.
7. Estimation of moisture content by air oven method
8. Mohr titration of salt in butter (AOAC method 960.29)
9. Determination of iodine content in salt
10. Titrable acidity assessment in orange juice, yogurt, apple juice and grape juice
11. Determination of crude fiber in different foods.
12. Protein estimation in different foods by Kjeldahl method, Lowry's method and Biuret and Bradford method.
13. Crude fat determination by solvent extraction method
14. Fat characterization with respect to the determination of the following: e) Refractive index, melting point, solid fat index, cold test, smoke point.
15. Qualitative characterization of fat and oil by Iodine value, Saponification number, Acid value, Free fatty acids value, Peroxide value
16. Different chromatographic techniques: Paper chromatography (Horizontal and vertical using aminoacids),
17. Demonstration of Thin layer chromatography for pigments and aminoacids and carbohydrates.
18. Demonstration of SDS-PAGE for food proteins
19. Demonstration of agarose gel electrophoresis.
20. Demonstration and HPLC instrumentation (demonstration)

Learning outcome:

The student will be able to learn the techniques used for food analysis. This will equip the student for employability in food quality labs. The student will gain experimental skills to isolate

food components and evaluate their variability of nutrition factors on food processing techniques.

References:

1. The Tools of Biochemistry – Terrance E. Cooper (John Wiley).
2. Analytical Biochemistry – David J Homes and Hazel Peak. Prentice Hall (Longman).
3. A Manual of Radiobiology – John.C.Steward and D.M.Hawcroft.Seattle: University of Washington Press (1977).
4. Practical Clinical Biochemistry –HaroldVarley. London William Heinemann.
5. A Biologist's Guide to Principles and Techniques of Practical Biochemistry-K.Wilson and K.H. Goulding, Cambridge University Press; 3rd edition (1991)
6. Physical Biochemistry – K E Van Holde (Prentice-Hall, 1998)
7. Instrumental Methods of Chemical Analysis – Gurdeep R Chatwal and Sham K Anand, Himalayan Publishing House.
8. Practical Biochemistry: Principles and Techniques – Wilson and Walker, Edward Arnold, 3rd Edition (1981)
9. H. Varley,GowenLock.A.H, willian Heinemann :Practical Clinical Biochemistry , Medical books CBS publishers and Distributors Ltd, 5th Edition
10. Raphel : Lynch's medical laboratory technology :, W B Saunders Co publication
11. Wootten: Micro analysis in Medical Biochemistry –Outline of Biochemistry - Coon and stump
12. J.Ochei and A. Kolhatkar:Medical laboratory science theory and practice, Tata MC Graw Hill publication, 4th Edition, 2008.
13. Medical Laboratory Technology, , Tata MC Graw Hill Publishers,1988.
14. Ramniksood :Text book of medical Laboratory technology, JAYPEE publisher, 2006.
15. Manual of Medical Laboratory Techniques, , JAYPEE Publisher, 1st Edition, 2008. 8.

PGD-CDAN 1.5: Biochemical Methods for Food Analysis-Theory

Credits: 4

Total Hrs: 60

Pre requisite; The student should be knowledgeable about chemistry or Biochemistry basic practical skills.

Objectives:

To acquaint students with the food analysis techniques, to understand the practical skills to measure the food constituents.

To familiarize students with the Biochemical techniques used in qualitative and quantitative estimation of food nutrients

Unit I:

Nature and Concept of Food analysis: Sampling and sample preparation-Definition, types, sampling plan, concept of sample size and representative. Sample preparations-particle size, homogeneity, dissolution technology and composition, storage of samples. Sample extraction, isolation, precipitation, Dialysis, ultra filtration, Reverse osmosis. Principle for pH meter.

Classical methods of food analysis: Law of mass action, volumetric and gravimetric analysis, preparation of standards, working standards and solutions. Concentration of solutions (percent, molar, molal, normal, ppm and ppb) and their dilution. Proximate analysis, physical methods for extraneous matter analysis.

15 Hrs

UNIT-II

Centrifugation: Importance in food analysis. Principle, Theory (RCF, Sedimentation coefficient) and types of Rotors, Ultracentrifugation. Applications in isolation of food components and food processing. **Classical food analytical techniques:** Densitometry, Gravimetry, Titrimetry, refractometry and polarimetry: principle, instrumentation and application of each technique in food analysis.

Spectroscopy: Electromagnetic spectrum, Beer and Lamberts law, Absorbance, Transmittance, Molar absorptivity (Molar extinction coefficient), Lambda maximum, Spectroscopic analysis of food components. Principle, instrumentation & application of Colorimetry UV-Vis spectrophotometer, Spectrofluorimeter, IR, Atomic Absorption Spectroscopy, Mass spectroscopy, NMR and ESR. Calorimetry: Bomb calorimeter, Principle of Rheological Analysis- Rheological parameters, rheological methods, instruments and application.

15 Hrs

UNIT-III

Chromatography: Theory & Principle, chromatographic parameter (partition coefficient, capacity factor, retention & dead time, Resolution, efficiency and their calculation), components of chromatography & types (partition and adsorbent). Principal and applications of paper (descending, ascending, radial and two dimensional) partition, Thin layer chromatography, size exclusion and ionexchange chromatography. Advance chromatography: GC, HPLC, HPTLC (principle, instrumentation & application), Separation technique & analysis, Applications in food analysis. **Electrophoresis:** Principle and concept. Paper & gel

electrophoresis, PAGE, iso-electric focusing, 2D electrophoresis, Immuno electrophoresis. Applications in food protein separation and analysis.

15 Hrs

UNIT-IV

Isotopic & immune techniques: Principle & theory of isotopic method, types, measurement and detection of radioactivity, Autoradiography, Immuno-techniques, Principle, antigen-antibody

interaction, enzymatic immune assay- ELISA and its types. Different immuno techniques of antigen detection in food sample. Application in food analysis. Quality assurance and quality control methods: Introduction to quality control in analytical methods. Terminology in analytical measurements: True value, measured value, Accuracy, Precision, Uncertainty, Random errors, sample traceability. External and internal quality controls. Certified reference materials. Spiked reference samples, Recovery studies, Method of validation and verification (LOD, LOQ, specificity, selectivity, linearity, range, robustness, repeatability, reproducibility. External and internal standards. Control chart. Proficiency testing, z-scores.

15 Hrs

Learning outcome:

The student will be able to learn the techniques used for food analysis. This will equip the student for employability in food quality labs. The student will gain experimental skills to isolate food components and evaluate their variability of nutrition factors on food processing techniques.

References:

1. The Tools of Biochemistry – Terrance E. Cooper (John Wiley).
2. Analytical Biochemistry – David J Homes and Hazel Peak. Prentice Hall (Longman).
3. A Manual of Radiobiology – John.C.Steward and D.M.Hawcroft.Seattle: University of Washington Press (1977).
4. Practical Clinical Biochemistry –HaroldVarley. London William Heinemann.
5. A Biologist's Guide to Principles and Techniques of Practical Biochemistry-K.Wilson and K.H. Goulding, Cambridge University Press; 3rd edition (1991)
6. Physical Biochemistry – K E Van Holde (Prentice-Hall, 1998)
7. Instrumental Methods of Chemical Analysis – Gurdeep R Chatwal and Sham K Anand, Himalayan Publishing House.
8. Practical Biochemistry: Principles and Techniques – Wilson and Walker, Edward Arnold, 3rd Edition (1981)
9. H. Varley,GowenLock.A.H, willian Heinemann :Practical Clinical Biochemistry , Medical books CBS publishers and Distributors Ltd, 5th Edition
10. Raphael : Lynch's medical laboratory technology :, W B Saunders Co publication
11. Wootten: Micro analysis in Medical Biochemistry –Outline of Biochemistry - Coon and stump
12. J.Ochei and A. Kolhatkar:Medical laboratory science theory and practice, Tata MC Graw Hill publication, 4th Edition, 2008.
13. Medical Laboratory Technology, , Tata MC Graw Hill Publishers,1988.
14. Ramniksood :Text book of medical Laboratory technology, JAYPEE publisher, 2006.
15. Manual of Medical Laboratory Techniques, , JAYPEE Publisher, 1st Edition, 2008. 8.

PGD-CDAN 1.6: Human Physiology and Nutrition through Life Cycle

Credits: 4

Total Hrs: 60

Pre requisite; The student should be knowledgeable about basic Biology concepts and should be interested to learn human physiology to understand health and disease.

Objectives:

To acquaint students with the knowledge of human physiology. Structure and functional importance of organ system to relate with health and disease.

To make students understand nutrition through life cycle and meal planning based on requirement to sustain health.

Unit-I.

Definition of anatomy and physiology, general anatomy of human body. Animal Cell Structure, Protoplasm, composition and function of Cell membrane, Structure and functions of Mitochondria, Endoplasmic reticulum, Ribosomes, Golgi apparatus, Lysosomes and Nucleus. Tissues, various types of tissues. Organs and organ systems-an integrated approach. **Digestive System:** Brief study of the anatomical organization of the digestive tract and process of digestion absorption and assimilation of food. **Circulatory System:** Heart Structure and working of heart. ECG, Blood vessels, lymph vessels and their functions. Lymphatic system. Composition and functions of blood and lymph. Mechanism of blood coagulation- blood grouping and blood transfusion. **Defense Mechanisms of the body:** Localization of infection; Inflammation, Active and Passive immunity, Introduction to T -lymphocytes and B-Lymphocytes; Immune responses.

15 Hrs

Unit -2

Respiratory System: Basic anatomy of the respiratory system. Process of respiration-Transport and exchange of oxygen and carbon dioxide in the body. **Excretory System:** Excretory organs-Structure and functions of Kidneys, Formation of urine, composition of urine, Role of Skin and Liver in excretion. **Nervous system:** Physiology of the nerve cell, Central and peripheral Nervous System and functions. Origin and propagation of nerve impulse, Synaptic transmission, neurotransmitters, **Endocrine Glands:** Structure and functions -Hypothalamus Pituitary gland, Thyroid gland, Pancreas (Islets), Adrenal gland, Testis, Ovary, General introduction to mode of hormones on target cells. **Reproductive System.** Male and Female reproductive systems. Menstrual cycle, Menopause and associated physiological problems.

15 Hrs

Unit-3

Basic Principles of Meal Planning:Definition, principles involved in meal planning and factors affecting meal planning. Recommended allowance-RDA for Indians, basis for requirement, energy allowance for various activities. General concepts about growth and development through different stages of life. **Nutrition during Pregnancy** – Weight gain, physiological changes, nutritional requirements, complications and nutritional problems in pregnancy. **Nutrition during Lactation** - physiology of lactation, hormonal control. Milk out put and factors affecting on nutritional components of colostrum and mature milk. Nutritional requirements of lactating women. **Nutrition during Infancy** - Growth and development, factors influencing growth, advantages of breast feeding, breast feeding vs bottle feeding, factors to be

considered in bottle feeding. Weaning Foods - Weaning foods and commercial baby foods. Nutritional requirements of infants. Problems in feeding normal and premature infants.

15 Hrs

Unit-4

Nutritional needs of pre-school children (1-5 year) - Nutritional and food requirements of pre school children. Factors to be considered while planning meals for pre-school children. Eating problems of children and their management, preparation of supplementary foods using available low cost foods. **Nutrition for School children** - Nutritional requirement, meal planning for school children, dental caries and packed lunch. **Nutrition during Adolescence** - Physical growth and nutritional requirements. Nutritional problems in adolescence- Iron deficiency anemia, obesity, anorexia nervosa and bulimia nervosa. **Nutritional needs of adults (men and women)** – Nutrition and work efficiency, nutritional requirement of the adult in relation to occupation. **Nutrition During Old Age** - Physiological changes in ageing, psycho-social and economic factors affecting eating behaviour. Nutritional problems of aged and their management.

15 Hrs

Learning outcome:

The student will be able to learn the concept of human physiology and will understand the functions of human organ systems. The student can learn to plan diet and will understand the nutritional planning through human life cycle.

References:

1. Ganong, W. F. (1985): Review of Medical Physiology, 12th Edition, Lange Medical Publication.
2. Moran Campell E.J., Dickinson, C.J., Slater, J.D., Edwards, C.R.W. and sikora, k.(1984): Clinical Physiology, 5th Edition, ELBS, Blackwell Scientific Publications.
3. Guyton, A.C,(1985): Function of the Human body, 4th Edition , W.B. Sanders Company, Philadephia. 4. Guyton, A.C, and Hall, J. B. (1996): Text Book of Medical Physiology, 9th Edition ,W.B. Sanders company, Prime Books (Pvt.) Ltd., Bangalore.
4. Wilson, K.J.W. and Waugh, A. (1996): Ross and Wilson Anatomy and Physiology in Health and Illness, 8th Edition, Churchill Livingstone.
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. Jain, A.K., Textbook of physiology. Vol I and II. Avichal publishing co., New Delhi.
7. SreeDevi.V. (1997). Nutrition Education. Discovery Publishing House, New Delhi.
8. Bamji, M.S., Rao, P.N. and Reddy, V. (1996). Textbook of Human Nutrition, Oxford & IBH Publishing Co. Pvt. Ltd.
9. Gopalan, C. (1995). Recent Trends in Nutrition, Oxford University Press, London
- 11.Srilakshmi (2008). Nutrition Science. New Age International Pvt. Ltd, New Delhi.
12. Mahan L K and Escott – Stump S (2000). Krause's Food Nutrition and Diet Therapy 10th Ed WB Saunders Ltd
13. 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
- 14.Sizer, F. and Whitney, E. (2000). Nutrition – Concepts and Controversies, 8th Edition, West Wadsworth, An International Thomson Publishing Co.
- 15.Whitney, E.N. and Rolfes, S.R. (2003). Understanding Nutrition, 8th Edition, West Wadsworth, An International Thomson Publishing Co. 4. Ira Wolinsky (Ed) (2003):

PGD-CDAN 1.7: Food Toxicology and Immunology

Credits: 4

Total Hrs: 60

Pre requisite; The student should be knowledgeable about basic Biology concepts and should be interested to learn toxicology and immunology to understand health and disease.

Objectives:

To acquaint students with the knowledge of food toxicology. It provides the information on food toxicants, food as drugs and food induced immune function.

To make students understand basics of human defence system, food and drug action and food for immunity.

Unit I:

Introduction to food toxicology: Classification of food toxins, Principles of Toxicology: Exposure, the dose response curve, absorption, distribution and elimination of toxicants. Biotransformation reactions for toxicants (Phase I and Phase II). Toxicants induced Carcinogenesis, mutagenesis and Teratogenesis. Organ toxicity. Natural Toxins in Foods of plant origin. Risk assessment. Pesticides in foods and their toxicity in human body. Marine toxins, Poisonous mushrooms and mycotoxins. Toxicants resulting from food processing. Food additives, food adulterations and pesticides. Risk of genetically modified food. Drug and chemical components in food and water. Heavy metal contamination of food and water. Food toxicity and health impacts.
15 Hrs

Unit-II:

Food as drugs. Use of traditional food formulations for therapy. Food nutritional components for treatment of disease. Drugs and pharmaceutical compounds- natural and synthetic, use of excipients. Characteristics of drugs **action:** Pharmacodynamics, pharmacokinetics, route and form of excretion. Drug abuse and drug resistance, Drug-nutrient interactions – effect of drugs on ingestion, digestion, absorption and metabolism of nutrients, effect on nutritional status, effect on organ function, drug dosage and efficacy. Nutrient effects on drug therapy – effects of dietary composition. Interactions between medication and milk, iron, fruit juices, and antacids. Food pharmacotherapy-concept, significance, adverse effects and future prospective.
15 Hrs

Unit-III:

Cells and Organs of the Immune system: Haematopoiesis; Hematopoietic Process and regulation; Cells of the Immune System; Cells involved in immune response: Macrophages, T- cells and B-cells; lymphoid organs, lymphoid tissues. Systemic Function of the Immune System. Natural killer cells, mechanisms of NK and T-Cell cytotoxicity. **Antigens:** Definitions: Immunogenicity and Antigenicity, Self-antigens and foreign antigens, haptens, epitopes, adjuvants and mitogens. **Immunoglobulins:** Isolation and purification of immunoglobulins. Classes and subclasses of immunoglobulins; Biosynthesis, theories of formation, diversity of antibodies. **Vaccines:** Immunization-Active immunization, Passive immunization, Adverse reactions from vaccines, immunization procedures, Production of vaccines and their uses.
15 Hrs

Unit IV:

Food allergy and Food Immunomodulation: Diet and immunity, Food nutrients and immunomodulations. Dietary compounds and gut immune health. Plant food compounds and immunomodulations. Immune stimulators and immunotoxins. Interaction of food components with cells and organs of immune system. Food allergy-concept, cause, symptoms, prevalence, immune mechanism of food allergy, and therapy. Food allergens-classification, nature, and characteristics. Allergic and hypoallergic foods. Immunomodulatory proteins, peptides and polysaccharides. Phytonutrients as immunomodulators. Immune boosting diet formulae. Traditional foods and immune function.

15 Hrs

Learning outcome:

The student will be able to learn the concept of Food toxicology, food and drug interaction and food immunology. The student will make familiarize with food as drug and understand food pharmacotherapy.

References:

1. Shibamoto T. and Bjeldanes L., Introduction to Food Toxicology, Academic Press, Inc. San Diego, CA. ISBN 0-12640025-3
2. Deshpande, S.S. (2002). Handbook of Food Toxicology, Marcel Dekker Inc. NY ISBN 0-8247-0760-5 3.
3. William H. W., Essentials of Environmental Toxicology. Taylor & Francis, Philadelphia, PA. ISBN 1-56032-470-4 4.
4. Fennema, O, Food Chemistry. Marcel Dekker 1997.
5. Cupp J and Tracy TS. 2003. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press.
6. Cellular and Molecular Immunology - A. Abbas, A. Lichtman, S. Pillai. Saunders, Elsevier, USA.
7. Kuby Immunology - Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen, WH Freeman Publisher.
8. Roitt's Essential Immunology - Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt, Wiley-Blackwell.
9. Primer to the Immune Response - Tak Mak Mary Saunders Bradley Jett, Elsevier
10. Immunology at a Glance - J.H.L. Playfair and B. M. Chain, Wiley-Blackwell.
11. Prescott's Microbiology - Joanne Willey, Linda Sherwood, Christopher J. Woolverton, McGraw Hill Education.
12. Fundamental Immunology - William E Paul. Wolters Kluwer Health/Lippincott Williams & Wilkins.

PGD-CDAN 1.8: Nutrition and Food service Field Work

Credits: 6

Total Hrs: 60

Pre requisite; The student should have interest on understanding nutritional aspects at food service work place and have inclusiveness to experience work nature.

Objectives:

To acquaint students with the knowledge of nutrition and food serviced work place. It provides the information on opportunity for work place with nutrition specialization.

To expose student with real work field to gain skill essential to find job after the course completion. He will have in person practical experience of the work and its applications.

1. Field visit to hospitals or Food Service Institutions & Hospitals /Clinics
2. Working with the experts at hospital and food service institutions to understand the nutrition status of patients and communities.
3. Collecting the work study report of the visiting centre with case by case reporting and analysing to consolidate report finding.
4. Submission of project work/report on case studies on a minimum of TWO centres on nutrition status in relevant to health and disease condition.
5. Data collection, analysis and reporting
6. A brief study tour report for visiting different food service, nutrition and diet therapy centres.
7. Report on internship will be evaluated as stated under project work regulations

Learning outcome:

The student will be able to learn and experience the nutrition and food service work place. He will be provided with guidance and will learn the practicality and skills required to sustaining in the job of preference.

II SEMESTER COURSES

General component -12 Credits

Skill Components -18 Credits

Total credits acquired on completion of course= 30

The student completing the first semester will be awarded with

**“PG Diploma in Clinical Dietics and Applied
Nutrition”**

PGD-CDAN 2.1: Functional foods and Nutritive Dietics –Theory

Credits: 4

Total Hrs: 60

Pre requisite; The student should have previous knowledge on food science and human nutrition.

Objectives:

To acquaint students with the knowledge of functional food components that enrich nutrition quality in foods. .

To expose student with nutritive dietics concept that provide him how diet containing functional food will help in treating the disease to restore health.

UNIT-I

Basic principle of balanced diet. Energy source and nutrients. nutritional requirements, food as source of nutrients. Proximate analysis of foods. Definition of S.I. units of calorific value of foods – bomb calorimeter. Respiratory quotient (R.Q) – definition, calculation of non-protein R.Q w.r.t carbohydrates and lipids. Measurement of energy expenditure by direct and indirect methods. Basal metabolic rate (BMR) – Definition, measurement of BMR by Benedict's Roth apparatus method. Factors affecting BMR. Specific dynamic action of food (SDA) – Energy requirement and recommended dietary allowances (RDA) for different physical activities for children and during pregnancy and lactating women. Concepts of an adequate diet, food budget proportionate cost of various foods in relation to their nutrient content. Principles involved in Planning diets. Normal Dietetics – Meal planning for the family at various stages of the life cycle– infancy to old age factors affecting food habits and their modifications. Cultural food patterns in India.

15 Hrs

UNIT-II

Functional foods Definition, development of functional foods, benefits and sources of functional foods in Indian diet. Effects of processing conditions and storage; Development of biomarkers to indicate efficacy of functional ingredients; Research frontiers in functional foods. **Nutraceuticals:** Use of nutraceuticals in traditional health sciences. Their role in preventing /controlling diseases. Definition, Classification, food and non food sources, mechanism of action. Role of omega-3,fatty acids, carotenoids, dietary fiber, phytoestrogens; glucosinates; organosulphur compounds as nutraceuticals **Development of nutraceutical and functional foods** – Standards for health claims. Process of developing - preclinical & clinical studies, Marketing and Regulatory issues, Regulatory bodies in India. . **Prebiotics and probiotics:** Usefulness of probiotics and prebiotics in gastro intestinal health and other benefits. Beneficiary microbes; prebiotic ingredients in foods; types of prebiotics and their effects on gut microbes. Proteins, modified proteins, application in product formulation.

15 Hrs

UNIT-III:

Metabolic pathways of macronutrients: **Carbohydrates:** Aerobic and anaerobic degradation, glycolysis and gluconeogenesis, TCA Cycle. HMP shunt pathway. Alcoholic fermentation. Hormonal regulations of blood glucose. Protein and amino acids: protein degradation, metabolism of amino acid pool, fate of nitrogen (urea cycle). Glutamine and alanine cycle, protein biosynthesis. Lipids: Metabolic pathways of triacylglycerol, fatty acids, cholesterol and

lipoproteins. Regulation of lipid metabolism and ketone bodies. Bioenergetics and oxidative metabolism – Concept of energy and its conversion, energy producing and utilizing systems (ETC). Iron and Heme Metabolism. Integration and regulation of metabolism during starvation, exercise, stress and diabetes mellitus. . Oxidative stress and Antioxidants: Free radicals. Role of free radicals and antioxidants in health and disease. Functional Carbohydrates: Starch, cellulose, hemicelluloses, hydrocolloids and gums-functions in food systems, properties, gelatinization, retrogradation and modified starches. Browning in foods: Enzymatic and non enzymatic-mechanism, method of prevention, relationship to health.
15 Hrs

UNIT-IV

Introduction to Nutrition and Dietetics: Definition and history of dietetics. Dietetics in contemporary medical management. Inter relationship between food, nutrition and health. Factors affecting food choices. Basic principles of planning a normal diet: characteristics of a normal diet, meeting nutrient requirements of individuals and family. Use of Dietary guidelines for Indians. Regular diet and rationale for modifications in energy and other nutrients, texture, fluid, soft diets. Principles of enteral and parenteral nutrition. Assessment of nutritional status in clinical situations and development of nutrition care plan. Assessment nutritional status in hospital setup methods. Psychological factors affecting food intake. Factors to be considered for counseling –Nutritional and health conditions including body care- skin, hair, face, hands, feet etc. Aging, gender related and other problems. Dietary management for nutritional disorders. Protein and energy malnutrition (hospital and domiciliary treatment), Vitamin A deficiency, Other deficiencies- osteoporosis, iodine and iron deficiency disorders etc. Feeding of Special groups- polio affected children, preterm infants and other conditions.
15 Hrs

Learning outcome:

The student will be able to learn the concept and components of functional foods and will also educate with nutritive diets and their application in planning diets to treat some disease alignments.

References:

1. Nutritional Science – B. Srilakshmi, New Age International Publishers, 2nd edition.
2. Textbook of Medical Biochemistry – MN Chatterjee, Rana Shinde, 7th edition, jaypee Brothers.
3. A textbook of Biochemistry – A V S S Rama Rao, 9th edition, UBS Publisher's Distribution Pvt. Ltd.
4. Text Book of Human Nutrition –Mahtab S. Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
5. Textbook of Medical Biochemistry – S Ramakrishnan, K G Prasannan, R Rajan, 3rd edition, Orient Longman,
6. Harper's Illustrated Biochemistry – Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 26th edition, Mc Graw Hills.
7. Experimental Biochemistry – A Student Companion – B Sashidhar Rao, Vijay Deshpande, IK International Pvt. Ltd.
8. Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
9. Clinical Biochemistry – Nagini
10. Principles of Biochemistry – Lehnninger A L, CBS Publishers and Distributors.
11. Textbook of Biochemistry (for Medical students) – DM Vasudevan and S Sreekumari, 4th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

PGD-CDAN 2.2: Clinical Biochemistry and Diet therapy -Theory

Credits: 4

Total Hrs: 60

Pre requisite; The student should have previous knowledge on Nutritional Biochemistry and human physiology with an idea of disease and health.

Objectives:

To acquaint students with the knowledge of clinical Biochemistry to characterize disease and to understand the Biochemical parameters to correlate disease pathology.

To expose student with the concept and methods of diet therapy and its application to address diet based management and treatment improvement for various disease.

UNIT-I

Basic concepts: Food, Nutrition, Health, Fitness. Interrelationship between nutrition and health, Health and disease. Normal and pathological changes affecting cells in the body. Cell death and the physiological causes; physical, chemical, biological agents and nutritional deficiency. **Clinical Biochemistry:** Definition, scope of biochemistry in diagnosis and prognosis. Collection and preservation of biological fluids-Blood and urine. **Disorder of carbohydrate metabolism:** Blood sugar level and its clinical significance- hypoglycemia and hyperglycemia. Diabetes mellitus- definition, clinical features, biochemical and metabolic changes (in brief). Glucose tolerance test- definition, types (oral GTT to be discussed in brief). **Disorder of lipid and amino acid metabolism:** Ketosis and their clinical significance- Hypercholesterolemia, atherosclerosis. Disorder of aminoacid metabolism- Alkaptonuria and phenylketonuria. Uric acid disorder-Gout.

15 Hrs

UNIT-2

Liver: Biochemical indices of hepatobiliary diseases. Bile pigments; formation of bilirubin, urobilinogen, bile acids. **Jaundice;** prehepatic, hepatic and post hepatic. Diagnosis Liver function tests, diseases of the liver - hepatitis cholestasis, cirrhosis, fatty liver and gallstones. **Kidney:** Assessment of renal function; creatine clearance, renal calculi, uremia, laboratory investigation of kidney disorders. **Gastrointestinal disorders:** Fractional gastric analysis, hypo and hyper acidity, gastric ulcers, malabsorption syndrome, steatorrhea, diarrhea. **Cardiovascular disorders:** Major Cardio vascular system, atherosclerosis, risk factors and pathogenesis. Diagnosis and prognosis. **Clinical Enzymology:** Definition of functional and nonfunctional plasma enzymes. Isoenzymes and diagnostic tests. Enzyme pattern in health and disease with special mention of plasma lipase, amylase, choline esterase, alkaline and acid phosphatase, SGOT, SGPT, LDH and CK.

15 Hrs

UNIT-3

Nutrition Care Process (NCP)- Nutritional assessment, - History taking, Nutrient intake analysis, anthropometry, usefulness of nutrition laboratory data, assessment of protein – energy status, Nutrition counseling: definition, concept, role of clinical dietician, the recipient and counseling environment and goals of counseling. Interpersonal relationships with patients, importance of nutrition education, medical ethics, Hospital dietary-scope and importance, types of food service, quality management. **Diet Therapy** – rationale for diet therapy (The normal diet, Modifications of the diet to the light diet, soft diet, full liquid diet, clear liquid diet, Tube feedings); Routes for diet therapy – enteral and parental; use of biochemical parameters in the

planning of diets, Use of computers in the planning of diets and hospital administration. Applications of dietary guidelines for the community, interrelationship between food nutrition and health, factors affecting food choices and regulation of food intake- hunger, satiety and role of neurotransmitters.

15 Hrs

UNIT-4

Standardization of portion sizes, Preparation of normal diets served in hospitals, Modification of normal diets to liquid diets, soft diets, full liquid diet, clear liquid diet, tube feeding. **Dietary Management in the treatment of following conditions** Obesity and underweight, Low Calorie diets, Child and Adult weight reduction. **Diabetes Mellitus**, without Insulin, with Insulin, with insulin – adult & juvenile, diabetes in pregnancy, Hypo-glycemic conditions. **G.I. diseases:** Diarrhoea and Constipation, Peptic Ulcer, Lactose intolerance, Ulcerate colitis, Conditions of intestinal obstruction and acute appendicitis, Hiatus Hernia **Diseases of the circulatory system:** Hypertension, Atherosclerosis, Angina Pectoris, IHD, Low Calorie, low cholesterol and low sodium diets for acute and chronic conditions. **Kidney diseases:** Acute & Chronic Glomerulonephritis, Nephrotic syndrome. **Kidney diseases:** Renal failure, Nephrolithiasis, Dialysis, Renal Transplant. **Liver diseases and gall bladder Allergy Diets of stressed patients** : Burns, Cancer, Surgery. **Nutritional management of low birth weight infants:** Pediatric diets, Infant diets & supplementary foods.

15 Hrs

Learning outcome:

The student will learn about different clinical parameters to understand disease and disorders. The student learn diagnosis and prognosis skills and will also know about designing therapeutics diets for disease management.

References:

1. Clinical Nutrition – Ed Michael J Gibney, Marinos Elia, Olle Ljungqvist and Julie Dowsett.
2. Text Book of Human Nutrition – Mahtab S Bamji, N Prahlad Rao, Vinodini Reddy, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd.
3. Food, Nutrition and Diet Therapy – Kathleen Mahan & Krause, Sylvia Escott Stump.
4. Normal and Therapeutic Nutrition - Robinson & Lawler, 17th edition, Mac Millan Publishers.
5. Foods – Nutrition and Health – Dr. Vijaya Khader, Kalyani Publishers.
6. Nutrition in Health and Diseases – Anderson, 17th edition.
7. Modern Nutrition in Health & Disease – Eds – Maurice E. Shils, James A. Olson, Moshe Shike, 8th edition, Vol I and II, Williams & Wilkins Publication.
8. Nutrition in clinical Practice – David L. Katz, Lippincott, Williams & Wilkins.
9. Clinical Dietetics and Nutrition – F P Antia and Philip Abraham.
10. Biochemistry – U Satyanarayana, U Chakrapani, Books & Allied (P) Ltd.
11. Perspectives in Nutrition – Wardlaw Kessel, Mc Graw Hills.
12. Experimental Biochemistry – A Student Companion – B Sashidhar Rao, Vijay Deshpande, IK International Pvt. Ltd.
13. Clinical Biochemistry – Nagini
14. Principles of Biochemistry – Lehninger A L, CBS Publishers and Distributors.

PGD-CDAN 2.3: Functional foods and Nutritive Dietics -Practicals

Credits: 2

Total Hrs: 60

Pre requisite; The student should have previous knowledge on food science and human nutrition.

Objectives:

To acquaint students with the knowledge of functional food components that enrich nutrition quality in foods.

To expose student with nutritive dietics concept that provide him how diet containing functional food will help in treating the disease to restore health.

Water activity – water sorption isotherms of different foods.

1. Functional properties of proteins – Water and fat absorption, emulsion and foaming properties, protein gels, (application in food products)
2. Starch Gelatinization and retrogradation – factors affecting and measurement of viscosity of starch gels, use of hydrocolloids/gums.
3. Browning reactions in foods.

Quantitative estimation of nutrients from food sources:

4. Estimation of Reducing and Non-Reducing Sugars in Honey
5. Estimation of Proteins in food using the Biuret Method
6. Saponification, Iodine value, and Acid Value of Edible Oils – fresh, stale and packed foods
7. Estimation of Lactose in Milk
8. Estimation of Ascorbic Acid in Foods
9. Estimation of Beta-Carotene in Foods
10. Estimation of Calcium, Phosphorous and Iron content of Foods
11. Estimation of Browning intensity by 2,6 dichloro indophenol method
12. Estimation of Anti-Nutritional Factors in Foods

Nutraceuticals and Vitamin quantitation from food samples

13. Estimation of lycopene in tomatoes
14. Estimation of oxalates from spinach
15. Estimation of Total Polyphenol content in green tea
16. Estimation of chlorophyll extract in leafy vegetables by spectrophotometric method
17. Estimation of tannin content in tea
18. Estimation of thiamin content of foods by Fluorimetric method.
19. Estimation of riboflavin content of foods by Fluorimetric method.
20. Estimation of antioxidant potential of foods.

Learning outcome:

The student will be able to learn the concept and components of functional foods and will also educate with nutritive diets and their application in planning diets to treat some disease alignments.

PGD-CDAN 2.4: Clinical Biochemistry and Diet therapy -Practicals

Credits: 2

Total Hrs: 60

Pre requisite; The student should have previous knowledge on Nutritional Biochemistry and human physiology with an idea of disease and health.

Objectives:

To acquaint students with the knowledge of clinical Biochemistry to characterize disease and to understand the Biochemical parameters to correlate disease pathology.

To expose student with the concept and methods of diet therapy and its application to address diet based management and treatment improvement for various disease

Clinical Biochemistry

1. Qualitative analysis of Inorganic and organic constituents in Urine
2. Qualitative analysis of Abnormal constituents in Urine
3. Qualitative analysis of Saliva
4. Qualitative analysis of Milk
5. Estimation of Keto acid by DNPH method.
6. Estimation of Urea by DAMO method.
7. Estimation of Creatinine by Jaffe's method.
8. Estimation of Cholesterol by Zak's method.
9. Estimation of titrable acidity and ammonia in urine.
10. Demonstration of glucose tolerance (GTT) using glucometer and strips to identify the insulin tolerance.

Diet planning and Diet therapy

11. Menu planning, food selection, planning and preparation of related dietary modification
12. Medical terminology and interpretation during diet therapy
13. Prepare counseling aids.
14. Visit to the hospitals-learn to use medical record to obtain required information.
15. Development of NCP for specific disease
16. Food exchange list and application

Learning outcome: The student will learn about different clinical parameters to understand disease and disorders. The student learn diagnosis and prognosis skills and will also know about designing therapeutics diets for disease management

PGD-CDAN 2.5: Food safety laws, regulations and Hospital management

Credits: 4

Total Hrs: 60

Pre requisite: The student should be familiar with food science concepts and have understood food toxicity and therapeutic diets.

Objectives:

The student will be exposed to various food regulatory guidelines and will be made aware of food safety protocols.

The student will be thought the laws, policies and regulatory guidelines of food safety.

UNIT-I

The importance of food safety, Food safety management procedures. The principal causes of food borne illness, The principal symptoms of food borne illness, poor safety practices affect food products, Food safety procedures in retail stores, Preventing food borne illness, Food hazards, The four c's, Record keeping, Due diligence, Reporting procedures, Legal responsibilities, The food business and the responsibilities of the managers. The principal food safety hazards on the human body, Basic rules regarding personal hygiene, Appropriate protective clothing, Good Manufacturing Practice. Contaminants- Sources of health hazard. Assessment of food safety – Additives (Intention – direct) – Preservatives, antioxidants, sweeteners, flavors, colours, vitamins, stabilizers. Indirect additives – organic residues – inorganic residues and contaminants. Cleaner production is food industry-fruit and vegetable processing, sea food processing, brewing and wine processing.

15 Hrs

Unit-II

International Food Policies and Regulation and Codex Alimentarius : Principles and standards of international food regulations; roles of various international agencies : WHO, FAO, Codex, and WTO; the WTO agreements in relation to SPS (Sanitary Phytosanitary Measures) and TBT (Technical Barrier to Trade), role and function of FEHD; health inspectors; Centre for Food Safety; regulations on harmful substances in food, imported meat and poultry, milk/dried milk, labeling, food business, frozen confections, coloring matters, preservatives, sweeteners and other additives; guidelines on voluntary labeling of genetically modified (GM) food, imported foods and food recall; microbiological guidelines for ready-to-eat food; code of hygienic practice for aseptically processed and packaged low-acid foods. The roles of Food and Drug Administration (FDA), FSSI, Department of Agriculture Environmental Protection food, Drug and Cosmetic Act, Dietary Supplement Health and Education Act, and other requirement related to GM labeling, nutrition labeling and health claims.

15 Hrs

UNIT III

Concept of hospitals – planning and design of hospital (building and physical layout) – Space required for separate function – different types of hospitals – problems and constraints in different type of hospitals – history of hospital development- Department and organization structure of different types of hospital. Organisation – structure – Vertical & Horizontal – Clinical & Non clinical – supportive & ancillary service departments. Nutrition and dietary services – pharmacy services – Medical records services. Facilities Engineering – Maintenance

of Civil Assets- Electrical supply and water supply – Medical gas pipeline — Air conditioning system – Hot water and steam supply – Communication system – Biomedical engineering department in modern hospital. Transportation services – Mortuary services – Hospital security services. Disaster management – Fire Hazards – Engineering Hazards – Radiology hazards.

15 Hrs

UNIT-IV

Hospital management (Patient care): Meaning and scope of patient care services – significance of patient care – role of administration in patient care – classification of Hospital. Front office services – outpatient services – inpatient services – Accident and Emergency services – Billing services. Lab services – Radiology and Imaging services – Rehabilitation services – Blood bank services – Telemedicine. Operation theatre – Intensive care units – Hospital acquired infections – Sterilization – Nursing services – Ward Management. Concept of quality – Quality control – Quality assurance – ISO 9000 standards – TQM – Accreditation – NABL – JCAHQ – Quality manual – Medical tourism. Role of medical records in health care delivery – general medical records standards and policies– legal aspects of medical records – medical audit computerization of medical records information needs in the hospital information– sources health information - uses of health and hospital data.

15 Hrs

Learning outcomes:

The students will learn about the food laws, food safety protocols and were educated with food regulatory guidelines of India and abroad. This help them understand and apply the regulatory procedure in food formulation and food manufacture process.

References:

1. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston , London.2004.
2. Mahindru, S.N. Food additives. Characteristics, detection and estimation. Tata McGrawHill Publishing Company Limited, New Delhi.2000.
3. Pearson, D. The Chemical Analysis of Foods. Churchill Livingstone, New York. 2002.
4. Sharma, B.K. Instrumental Methods of Chemical Analysis. Goel Publishing House, New Delhi. 2004.
5. Poornimacharantimath, Total quality management, Dorling Kindersley, Publishers South Asia Ltd., 2009.
6. Sohrab, 2001 Integrated ISO 9001 HACCP for food processing industries, allied publishers ltd, Mumbai
7. Krammer, A. and Twigg, B.A. 2006. Quality control for the food industry, Volume 2 .Applications. The AVI Publishing Company. Inc., Westport, Connecticut.
8. Ranganna, S. 1994. Hand book of analysis and Quality control for fruits and vegetable products. Tata McGraw hill. New Delhi.
9. Huss, H.H, Ababouch, L and Gram, L. 2003. Assessment and Management of Seafood Safety and Quality,
10. FAO fisheries technical paper 444, Food and Agriculture Organization of the United Nations Rome.
11. Assuring food safety and quality. 2012. FAO Food and Nutrition Manual., FAO publications, Rome. 5. FSMS Manual for bakery and confectionery industry. 2014.

PGD-CDAN 2.6: Diet formulations, Public health and Dietetics

Credits: 4

Total Hrs: 60

Pre requisite: The student should have pre exposed to the concept of nutritional Biochemistry and food science and clinical nutrition.

Objectives:

- The student will acquire information on public health status and different national nutritional program to tackle nutritional deficiency.
- The student gain information about diet planning and formulation for various clinical disease and disorders to improve treatment outcome.

UNIT-I

Public health: Concept Scope Future projections of Health care Role of public nutritionists in health care delivery. Nutritional problem in India: Protein Energy Malnutrition Micronutrient Deficiencies Vitamin Deficiencies. **Assessment of nutritional status:** Population sampling Anthropometry Clinical assessment Biochemical assessment Dietary assessment. **National nutritional programmes:** Integrated Child Development Services (ICDS) Programme Nutrient Deficiency Control Programme Supplementary Feeding Programme Food Security Programme. **Strategies to combat national nutritional problems:** Introduction, Diet or food based strategies, Nutrient based strategies, Immunization. **Nutrition and health education:** Definition Importance Channels of nutrition education Nutrition education methods, Planning for Nutrition and Health Education. Techniques of Nutrition Education Role of Nutrition Education Programs in eradication of malnutrition.

15 Hrs

UNIT-II

Nutrition Counselling: Definition, concept, the role of clinical dietitian, the recipients, counseling environment. **A systems approach to nutritional care:** overview of the system, components of the system. **Factors to be considered for counseling:** Nutritional and health conditions, including body care, skin, hair, face, hands, feet etc. Psychological conditions, food allergies, aging, gender related and other problems. **Assessment component:** Methods of interview – verbal and nonverbal techniques. Counseling models – data analysis (dietary, biological, environmental, behavioral data). Facilitator resource analysis – Culmination of the assessment process. **Planning component:** Designing of counseling plans – goals & objectives, classifying objections, resource planning – client care plan and designing evaluation instruments. **Implementation component:** counseling the client/patient – client concurrence, co- ordination of care plans-the provision of learning experience. **Evaluation component:** Measuring the success of performance of client and evaluating the counseling process.

15 Hrs

UNIT-III

Introduction to Dietetics: Definition, Growth, source of dietetics, importance, relationship with health. Definition of Nutrition Care Process, Steps of Nutrition Care Process. Definition of therapeutic nutrition, objectives of therapeutic diet, principles of therapeutic diets, therapeutic nutrition for changing needs. **Therapeutic Diets:** concept Therapeutic Adaptation of Normal Diet Factors Considered Routine Hospital Diets Mode of feeding methods Role of dietitian in the Hospital and Community Patient Care and Counseling. Definition of dietetics & counselling,

factors affecting counselling, planning, implementing dietary care, Team approach to nutritional care. **Diet in fever:** Nutrition and Infection, Metabolic changes during Infection, Typhoid fever, Tuberculosis, HIV Infection and AIDS. **Diet in weight imbalance and counselling:** Obesity and Underweight Causes, Health Risk, Dietary Treatment and Psychotherapy.

15 Hrs

UNIT-IV

Diet in disease of GI Tract and counselling: Upper GI Tract Disorders, Lower GI Tract Disorders. Diet in Liver disease and counselling: Hepatitis, Cirrhosis, Hepatic coma, Disease of gall bladder and pancreas. **Diet in Kidney disease and counselling:** Glomerulonephritis, Acute and chronic renal failure. Disease of metabolic disorder and counselling: Diabetes mellitus, Gout. **Diet in Cancer and Counselling:** risk factors, Metabolic alterations and nutritional problems related to cancer. Nutritional requirements of cancer patients related to cancer therapy, Cancer prevention. **Diet in Cardiovascular disease and counselling:** coronary heart disease (CHD), risk factors and pathophysiology, Atherosclerosis, hypertension, myocardial infarction, congestive cardiac failure. Diet importance in therapy.

15 Hrs

Learning outcomes:

The student learns about public health status and diet formulations and nutrition planning for various disease and disorders. The students will be also learn the pathophysiology and biochemical and metabolic diseases.

References:

1. Mary - Jane Schneider and Henry Schneider "Introduction to Public Health", 2nd edition, Jones and Bartlett publishers, Inc, Canada, 2006.
2. Bernard J. Turnock "Essentials of Public health", Second edition, Jones and Bartlett learning, LLC, Canada, 2012. 29
3. Richard Skolnik "Global Health 101", Second edition, Jones and Bartlett learning, LLC, an ascent learning company, Canada, 2012.
4. Public Health Nutrition – Michale J. Gibney, Barrie M. Margetts, John M. Kearney and Lenore Arab (Eds.) – Nutrition Society Textbook Series, Blackwell Publishing.
5. Nutritional Science – B. Sri Lakshmi, New Age International Publishers, 2nd edition
6. Social and Preventive Medicine – Part & Park. Goyet, Fish. V. Seaman, J and Geijer. U. (1978)
7. The management of Nutrition Emergencies in Large Population, WHO, Geneva. The Management of Nutrition in Major emergencies, WHO in collaboration with UNHCR, International Federation of Red Cross and Red Crescent societies and WFP.
8. Owen. A. Y. and Frankle, R. T. (1986) Nutrition in the Community. The Art of delivering Services, 2nd ed. Times Mirror/ Mosby. WFP/ UNHCR (1998) WEP/ UNHCR
9. Guidelines for Selective Feeding Programmes in Emergency Situations. Rome and Geneva: WEP & UNHCR.
10. Goyet, Fish. V. Seaman, J. and Geijer, U. (1978) The Management of Nutritional emergencies in Large Populations, World Health Organization, Geneva.

PGD-CDAN 2.7: Nutrogenomics and bioinformatics

Credits: 4

Total Hrs: 60

Pre requisite: The student should have understanding of nutrition and biochemical target of diet therapy and disease mechanism.

Objectives:

The student will be exposed to basic molecular biology concept and central dogma process of replication, transcription and translation.

The student will be thought of nutrition in gene regulation and nutrient and gene interaction in various disease and possible therapeutic targets

The student will be introduced to basic concept of computational Biology and Bioinformatics.

UNIT-I

Introduction: DNA as a genetic material, Central dogma of molecular biology. **DNA**

Replication: Types of replication-conservative, semi conservative, dispersive. Experimental verification of semi conservative mode of replication. Enzymes involved in replication. Mechanism of DNA replication in prokaryotes-origin and replication fork, role of DNA polymerase. Discontinuous DNA synthesis. RNA primer in DNA synthesis. DNA ligase and its role. DNA damage and repair mechanisms. **RNA Biosynthesis-** Transcription in prokaryotes- Transcription factors and machinery, formation of initiation complex, activators and repressors, Role of RNA polymerase, elongation, termination and post transcriptional modifications. Reverse transcription.

15 Hrs

UNIT-II

Genetic code: Deciphering of the genetic code-Nirenberg and Khorana work general features, coding properties of t-RNA, wobble hypothesis. **Protein biosynthesis:** A brief account of ribosome's (in prokaryotes), activation of amino acid formation of Initiation complex, initiation factors and their regulation, elongation and elongation factors, termination. Post translational modification and inhibitors of protein synthesis, Protein trafficking mechanism. **Gene regulation:** Regulation of gene expression in prokaryotes its types, Operon concept- Lac operon, Trp operon. Role of chromatin in regulating gene expression and gene silencing. Inhibitors- Replication, Transcription and Translation as targets for Antibiotic action.

15 Hrs

UNIT-III

Introduction to Gene-Diet interactions: Nutrigenomics- Scope and Importance to Human Health and Industry. Transporter gene polymorphisms -interaction and effects of micronutrients in humans. Polymorphisms in genes affecting the uptake and transport of omega-6 and omega-3 polyunsaturated fatty acids: interactions with dietary lipids and chronic disease risk. Nutrigenomics approaches to unraveling physiological effects of complex foods. The intestinal microbiota - role in nutrigenomics. **Modifying Disease Risk Through Nutrigenomics:** Modulating the risk of cardiovascular disease through nutrigenomics; Modulating the risk of diabetes through nutrigenomics; Modulating the risk of inflammatory bowel diseases through nutrigenomics; Modulating the risk of obesity through nutrigenomics;

Modulating the risk of cancer through nutrigenomics; Modulating the malnutrition through Nutrigenomics.

15 Hrs

UNIT -IV

Basic Bioinformatics- Introduction to bioinformatics, its importance and scope, different disciplines of bioinformatics, relationship with various branches of life sciences. Computational approaches to Biological sciences. Detailed study of various data bases-Definition, information generation, Storage, editing and retrieval. Classification- Database management, public agencies-NCBI data model and structure of EIG and genome net and Gene bank sequence database. **Sequence alignment and database** searching: Introduction, protein and nucleic acid sequence analysis, models of sequence analysis, tools for sequence search, analysis and alignment. Sequence, comparison by BLASTA and FASTA. **Phylogenetic analysis-** Tree building, basic concept and methods of phylogenesis evaluation. **Genomic project:** An overview of human genome project, Application of bioinformatics.

15 Hrs

Learning outcomes

The student will learn molecular biology concepts. He will understand the gene mechanism and role in various human disease and disorder. The student learn to use nutrient gene interaction in modulating disease pathology. The student will also learn basic bioinformatic techniques.

References:

1. Molecular Biology– David Freifelder, Narosa Publishers (1987).
2. Essential of Molecular Biology – David Freifelder.
3. Microbial Genetics – David Freifelder, Jones and Bartlett Publishers.
4. Genes –Series-V toXI – Benjamin & Lewin, Jones and Bartlett Publishers.
5. Molecular Biology of the Gene – J.D. Watson et al., Pearson Publishers.
6. Molecular Biology - David Clark Nanette PazdernikMichelle McGehee. Academic.
7. Principles of Biochemistry - Geoffrey Zubey, Wm.C. Brown Publishers.
8. Molecular Biology of the Cell – Davidson, Lodish, Darnell and Baltimore.
9. Molecular Biology –Robert F Weaver. McGraw-Hill Higher Education.
10. 10.Landmark Experiments in Molecular Biology – Michael Fry. Academic Press
11. Bioinformatics- Concepts, Skills and Applications. --- S.C. Rastogi, amitaMendiratta and ParagRastogi (2003). CBS Publishers and Distributors, New Delhi.
12. Bioinformatics – A practical guide to the Analysis of Genes and Proteins. Andreas D Baxeains and B.F. Francis Ovellette. (2002) John Wiley & Sons.
13. Developing Bioinformatics – Computer Skills. An Introduction to software tools for Biological Applications. --- Cynthia Gibas& Per Jambeck. (2003) O'RELLY Pubs.
14. Bioinformatics- Managing Scientific Data. Zoe'Lacroix and Terence Critchlow. (2003) Morgan Kaufmann Pubs.
15. Bioinformatics- Sequence and Genome Analysis--- David Mount (2003) CBS Publishers and Distributors.

PGD-CDAN 2.8: Hospital internship and Food industry internship

Credits: 6

Total Hrs: 60

Pre requisite; The student should have interest on understanding diet importance in health care as nutritionist or dietician. He should be aware of application of diet formulation in hospital and food industry.

Objectives:

To acquaint students with the knowledge of diet therapy at hospital and nutritional composition at food industry.

To expose student with real work field to gain skill essential to find job after the course completion. Student will have in person practical experience of the work and its applications.

1. Internship in hospitals or Food Service Institutions & Hospitals /Clinics
2. Submission of project work/report on case studies on a minimum of TWO centres on nutrition status in relevant to health and disease condition.
3. Data collection, analysis and reporting
4. A brief study tour report for visiting different food service, nutrition and diet therapy centres.
5. Report on internship will be evaluated as stated under project work regulations
6. Identifying a specialty care unit: diabetic clinic/ weight management center/health clubs/hospitals/nursinghomes-select atleast 3-4 patients
7. Case studies: (a) Obtaining Development of tools for assessment of in- patients and out patients.
8. Screening of patients and interpretation of medical history.
9. NCP, dietary prescription and counseling of patients with following conditions (atleast 2 to 3 cases to be taken up by each student).
10. Obesity, diabetes mellitus (NIDDM and IDDM), hepatitis and cirrhosis, myocardial/cerebral infarction, renal failure, calculi and nephritic syndrome, fever-chronic and acute.
11. Learning preparation of enteral feeds and demonstration of different types of tube feeding. Learning instruments to measure body composition.
12. Learning the use of Computer application in dietetics and diet formulation and therapeutic nutrition.

Learning outcome:

The student will be trained with hands on skills and will experience the work condition being with professional. The students will acquire the professional training for future placements in health care system as trained dietitians.