

Course Curriculum

(As per ICAR- 5th Dean's Committee Recommendations)



B. Sc. (Hons.) Food Nutrition and Dietetics



Sri Sri University

Sri SriVihar, Bidyadarpur Arilo, Ward No. 3, Cuttack 754 006, Odisha

The course curricula of B.Sc. (Hons.) Food Nutrition and Dietetics is as per the recommendations of 5th Dean's Committee Report, Indian Council of Agriculture Research (ICAR), New Delhi. New courses are included to upgrade the new topics of relevance. The course curriculum is distributed in 8 semesters during 4 year's period.

Program outcome: Promotes student centric mentoring and imparting technical knowledge with major focus on Food, Nutrition, Processing, Quality Control and Health and hands-on experience in the core subject domain. Students after completion of the program should be able to i) Comprehend the interdisciplinary science of Food, Nutrition, Health benefits of various types of food and allied scientific knowledge on food processing industry; ii) Comprehensively gain the knowledge on food quality, nutrition certification, food preservation and contamination; iii) and iv) Ability to develop entrepreneur skills to initiate start-up companies in food, nutrient and dietetics with major focus on traditional and contemporary foods and value addition.

Graduates have several career option to serve at various capacity viz., i) Sports Nutritionist; ii) Administrative Nutritionists; iii) Nutrition Trainer; iv) Food Consultants; v) Therapeutic Dietitian; vi) Public Health/Community Dietitian; vii) Food Show Host; viii) Gym trainer; ix) Food Nutritional FMCG companies; x) Practitioners of traditional food and nutrition; xi) Researcher xii) Higher studies;

Course Outline

1. Basic Sciences and Humanities

Course Title	Credit Hours
General English	2 (1+1)
Technical Writing (English)	2 (1+1)
Elementary Statistics	3 (2+1)
Agricultural Informatics	3 (1+2)
Nutritional Biochemistry – I	3 (2+1)
Nutritional Biochemistry – II	3 (3+0)
Environmental Studies and Disaster Management	3 (2+1)
Elementary Human Physiology	3 (2+1)
Nutrigenomics	3 (3+0)
Communication Skills and Personality Development	3 (2+1)
Economics and Marketing	3 (2+1)
Introduction to Rural Sociology	2 (2+0)
National Service Scheme	2 (0+2)
Total	35 (23+12)

2. Core Courses

S. No.	Course Title	Credit Hours
1	Fundamentals of Food Science	3 (2+1)
2	Principles of Human Nutrition	3 (3+0)

3	Normal Nutrition and Meal Planning	3 (2+1)
4	Therapeutic Nutrition – I	4 (2+2)
5	Therapeutic Nutrition –II	3 (2+1)
6	Food Analysis	4 (2+2)
7	Food Chemistry	4 (3+1)
8	Food Microbiology	3 (2+1)
9	Methods of Cookery	3 (2+1)
10	Food Processing and Packaging	4 (3+1)
11	Food Preservation and Storage	4 (2+2)
12	Introduction to Clinical Nutrition	4 (3+1)
13	Community Nutrition	4 (2+2)
14	Nutrition Education	3 (1+2)
15	Food Hygiene and Sanitation	4 (2+2)
16	Food Standards and Quality Control	4 (2+2)
17	Pulses and Oilseeds: Preparation and Utilization	3 (2+1)
18	Special Cookery/Bakery and Confectionary	4 (2+2)
19	Nutraceuticals and Health Foods	3 (3+0)
20	Public Health Nutrition	4 (3+1)
21	Sports Nutrition and Physical Fitness	3 (2+1)
22	Nutrition in Emergencies	2 (2+0)
23	Nutrition Through Life Cycle	3 (2+1)
24	Milk and Milk Products: Preparation and Utilization	4 (2+2)
25	Cereals and Millets: Preparation and Utilization	3 (2+1)
26	Meat and Meat Products: Preparation and Utilization	3 (2+1)
27	Food Product Development and Formulations	2 (1+1)
28	Food Toxicology	2 (2+0)
29	Fruits and Vegetables: Preparation and Utilization – I	2 (1+1)
30	Food Service Management – I	2 (2+0)
	Total	97 (63+34)

3. Student Ready Program

Hands on Training to develop competence, capability, capacity building, acquiring skill, expertise and confidence to start their own enterprise and turn job creators instead of job seekers.

S. No.	Course Title	Credit Hours
1	Fruits and Vegetables: Preparation and Utilization – II	2 (0+2)
2	Nutritional Status Assessment Methods	3 (0+3)
3	Food Service Management – II	3 (0+3)
4	Diet and Nutrition Counseling	2 (0+2)

5	Special Project	5 (0+5)
6	Entrepreneurship Development and Business Management	4 (0+4)
7	Seminar	1 (0+1)
8	In-Plant Training/Experiential Learning	20 (10+10)
	Total	40 (0+40)

Semester-wise course

SEMESTER- I		
	Course Title	Credit Hours
ENS 101	General English – I	2 (1+1)
AGI 101	Agricultural Informatics	3 (1+2)
ENS 101	Environmental Studies and Disaster Management	3 (2+1)
EHP 101	Elementary Human Physiology	3 (2+1)
NBC 101	Nutritional Bio Chemistry – I	3 (2+1)
PHN 101	Principles of Human Nutrition	3 (3+0)
FFS 101	Fundamentals of Food science	3 (2+1)
PYE 101	Physical Education and Yogic Science	2 (0+2)
Total		22 (13+9)
SEMESTER -II		
TWE 102	Technical Writing (English)	2 (1+1)
NBC 102	Nutritional Biochemistry- II	3 (3+0)
MCK 102	Methods of Cookery	3 (2+1)
ECM 102	Economics and Marketing	3 (2+1)
IRS 102	Introduction to Rural Sociology	2 (2+0)
FOA 102	Food Analysis	4 (2+2)
FPS 102	Food Preservation and Storage	4 (2+2)
Total		21 (14+7)
SEMESTER- III		
EST 103	Elementary Statistics	3 (2+1)
FMB 103	Food Microbiology	3 (2+1)
FSM 103	Food Service Management - I	2 (2+0)
ICN 103	Introduction to Clinical Nutrition	4 (3+1)
NLC 103	Nutrition Through Life Cycle	3 (2+1)
CMN 103	Community Nutrition	4 (2+2)
CMU 103	Cereals and Millets: Preparation and Utilization	3 (2+1)
FSM 103	Food Service Management- I	2 (2+0)
Total		24 (15+7)
SEMESTER- IV		
CPD 104	Communication Skills and Personality development	3 (2+1)
FPF 104	Food Product Development and Formulations	2 (1+1)

FVU 104	Fruits and Vegetables: Preparation and Utilization - I	2 (1+1)
NNP 104	Normal Nutrition and Meal Planning	3 (2+1)
MPU 104	Milk and Milk Products: Preparation and Utilization	4 (2+2)
PNT 104	Public Health Nutrition	4 (3+1)
FCT 104	Food Chemistry	4 (3+1)
	Bio-safety and Bioethics	1 (1+0)
Total		22 (14+8)
SEMESTER - V		
TPN 105	Therapeutic Nutrition - I	4 (2+2)
FYS 105	Food Hygiene and Sanitation	4 (2+2)
FQC 105	Food Standards and Quality Control	4 (2+2)
SNF 105	Sport Nutrition and Physical Fitness	3 (2+1)
NEM 105	Nutrition in Emergencies	2 (2+0)
NED 105	Nutrition Education	3 (1+2)
NUG 105	Nutrigenomics	3 (3+0)
TFH 105	Traditional Food and Nutrition	2 (1+1)
	Total	23 (14+9)
SEMESTER - VI		
THP 106	Therapeutic Nutrition - II	3 (2+1)
FPP 106	Food Processing and Packaging	4 (3+1)
POU 106	Pulses and Oilseeds: Preparation and Utilization	3 (2+1)
NHF 106	Nutraceuticals and Health Foods	3 (3+0)
MMP 106	Meat and Meat Products: Preparation and Utilization	3 (2+1)
BCF 106	Bakery and Confectionary	4 (2+2)
FTL 106	Food Toxicology	2 (2+0)
	Total	22 (16+6)
SEMESTER - VII		
IPT 701	In-Plant Training	20 (0+20)
	Total	20 (0+20)
SEMESTER - VIII		
IPT-FVU 801	Fruits and Vegetables: Preparation and Utilization - II	2 (0+2)
IPT-NAM 802	Nutritional Status Assessment Methods	3 (0+3)
IPT-FSM 803	Food Service Management – II	3 (0+3)
IPT-DNC 804	Diet and Nutrition Counseling	2 (0+2)
IPT-SEM 805	Seminar	1 (0+1)
IPT-SPP 806	Special Project	5 (0+5)

IPT-EBM 807	Entrepreneurship Development and Business Management	4 (0+4)
Total		20 (0+20)

SYLLABUS

Semester- I

ENG 101 General English 2 (1+1)

Course objectives: Train in use of English as communication language and writing technical content.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Effectively speak and use English in conversation in an academic environment.
- Reliably demonstrated the ability to use the conventions of grammar when creating paragraphs.
- Effective in comprehension of a technical writing, develop manuscripts and reports.

Theory

Word, formation, prepositions, idiomatic, expressions, conditional, sentences and modal verbs. Synthesis and transformation; essay writing (5 topics to be discussed), precise writing. Study of Prose and short stories from brighter English (A book of short stories, plays, poems and essays by C.E. Eckersley, Orient Longman, New Delhi, 1984) The Bachelor of Arts by R.K. Narayan

Practical

Based on lectures Language, work the prescribed lessons having a bearing on the topics covered in lectures. Identification of phonetic sounds and symbols Stress and intonation Listening comprehension. Conversation practice.

Suggested Readings:

- Allen, W.S. (1962) Living English Structure, Orient Longmans, London.
 Jones, Daniel. (1993). Everyman's English pronouncing dictionary. University Book Stall, New Delhi.
 Jones, D. (1970). An Outline of English phonetics, Arnold, London.
 George, H.V. (1970). Common errors in English learning, M/s Newbury House, London.
 Sharma, S.D. (1984). A textbook of spoken and written English, Vikas, Delhi.

AGI 101 Agricultural Informatics 3 (1+2)

Course objectives: To have a clear understanding of innovative ideas, techniques and scientific knowledge to manage and analyze agricultural data.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Use MS office for creating, editing and formatting a document
- Analyze any agricultural data using basic statistics and various packages

- Create a scientific website

Theory

Introduction to computers, anatomy of computers, memory concepts, units of memory, operating system, definition and types. Application of MS-Office for creating, editing and formatting a document, data presentation, tabulation and graph creation, statistical analysis, mathematical expressions. Database- Concepts and types, creating database, uses of DBMS in health and nutrition. Internet and World Wide Web (WWW)- Concepts, components and creation of web, HTML, XML coding.

Practical

Study of computer components, accessories, practice of important DOS commands. Introduction of different operating systems such as windows, Unix, Linux, creating files and folders, file management. Use of MS-WORD and MS Powerpoint for creating, editing and presenting a scientific document, handling of tabular data, animation, video tools, art tool, graphics, template and designs. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros. MS-ACCESS: Creating database, preparing queries and reports. Introduction to World Wide Web (WWW) and its components, creation of scientific website, presentation and management of health information through web. Use of smart phones and other devices for health warning signs and dietary management. Hands on practice on preparation of decision support system.

ENS 101 Environmental Studies and Disaster Management 3 (2+1)

Course objectives: To be more aware about the surrounding in terms of abiotic and biotic components.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Analyze any natural resources in terms of its degree of exploitation with possible solutions
- Realize about the importance of biodiversity and its protection measures.
- Learn about various water conservation techniques and rain water harvesting measures
- Aware other people regarding various natural and artificial disasters with possible solutions.

Theory

Multidisciplinary nature of environmental studies- Definition, scope and importance. Natural resources- Renewable and non-renewable resources and their associated problems. Forest resources- Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forest and tribal people. Water resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources- Use and exploitation, environmental effects of extracting and using mineral resources. Food resources- World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources- Land as a resource, land degradation, man induced landslides, soil erosion and desertification. 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. Introduction, types, characteristic features, structure and function of forest,

grassland, desert and aquatic ecosystems. Biodiversity and its conservation- Introduction, definition, genetic, species, ecosystem diversity and biogeographical classification of India. Value of biodiversity- Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity- Habitat loss, poaching of wildlife, man-wildlife conflicts, endangered and endemic species of India. In-situ and Ex-situ conservation of biodiversity.

Environmental pollution- Definition, cause, effects and control measures of air, water, soil, marine, noise and thermal pollution and nuclear hazards. Solid waste management- Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Social issues and the environment- Unsustainable to sustainable development, urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics- Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Environment protection acts- Air (Prevention and control of pollution) act, water (Prevention and control of pollution) act, wildlife protection act, forest conservation act, Issues involved in enforcement of environmental legislation, public awareness. Human population and the environment- Population growth, variation among nations, population explosion. Role of Information Technology in environment and human health.

Natural disasters- Meaning and nature, types (floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, heat and cold waves, global warming, sea level rise, ozone depletion) and effects. Man-made disasters- Nuclear, chemical, and biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents. Disaster management- International strategy for disaster reduction at national and global levels; National disaster management framework- Financial arrangements, role of NGOs, community-based organizations and media, central, state, district and local administration, armed forces in disaster response, police and other organizations. Feeding the people struck by the disaster, managing house and dress need during disaster.

Practical

Visit to a local area to document environmental assets river/forest/grassland/hill/mountain, visit to a local polluted site-Urban/rural/industrial/agricultural. Study of common plants, insects, birds and study of simple ecosystems i.e. pond, river, hill slopes, etc. Case-studies.

Suggested Readings:

- Bharucha, E. (2005). Text book of environmental studies. University Grants Commission, University Press, New Delhi.
- Kapur, A. (2005). Disasters in India: Studies of grim reality. Rawat publication, Jaipur.
- Chauhan, B.C. (2008). Environmental studies. University Science Press, New Delhi.
- De, A.K. (2010). Environmental chemistry. Willey Eastern Ltd. New Delhi.
- Singh, S. and Singh, J. (2013). Disaster Management. Pravilika Publication Allahabad.

EHP 101 Elementary Human Physiology 3 (2+1)

Course objectives: To gather knowledge across many levels, including normal body functioning, biochemistry, cell physiology, organ systems and the body as a whole.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Identify various body organs along with the basic structure and function of animal cell
- Estimate RBC and WBC by haemocytometer

- Measure the pulse rate and blood pressure.

Theory

Introduction to anatomy and physiology and structural organization of body. The cell – Structure, its organelles, functions and multiplications, different types of cells and their functions, movement of particles across cell membrane - Active transport and passive transport, Body fluids and its compartments and functions, Water output and input into the body and maintenance of water balance in human body, the tissues – Types, structure and their functions, the skeletal system - Anatomy and functions, structure, formation and development of bones, different types of bones and types of joints and their movements, Circulatory system - The blood - Composition and function, blood clotting and blood grouping, Heart – Structure, functions, types of circulatory systems, blood pressure and heart rate and factors affecting it, electrocardiogram, the respiratory system - anatomy, functions, mechanism of breathing and respiratory volumes, gas transport and respiratory adaptation, the digestive system - anatomy and functions of alimentary tract and accessory organs, process of digestion of food, absorption and assimilation of digested food, enzymes involved in digestion of food, liver - Structure and functions, Pancreas – Structure and functions, the urinary system - Anatomy and functions, formation and composition of urine, the endocrine system - important ductless glands of the body and their functions, the reproductive system - Male reproductive system – Anatomy and functions, female reproductive system – Anatomy and functions, menstrual cycle, the nervous system - elementary study of (anatomy and functions), sensory organs – (anatomy and functions). Glossary of terms used in physiology.

Practical

Demonstration of animal viscera, identification of systems and organs, identification of cells – epithelial, muscle, nerve etc, Transverse section of stomach, intestine – small and large demonstration of specimens of spleen, kidney and brain models of excretory and reproductive organs and their histology, colorimeter, estimation of RBC count by haemocytometer, estimation of WBC count by haemocytometer, differential counting of WBC using peripheral smear, Estimation of PCV, ESR, micro and macro haematocrit, estimation of bleeding and clotting time and blood groups, measurement of pulse rate and blood pressure, its variation with exercise, testing for sensation, special sensors, measurement of body temperature, diurnal variations.

Suggested Readings:

Arthur J. V. Human physiology- The mechanisms of body function, Tata McGraw Hill Publishing Company, New Delhi.

Samson, Applied physiology 10th edn. Revised by Keele, C.A. and Neil, B. Oxford University Press, New York.

Guyton C. Text Book of medical physiology 5th edn. W.B. Saunders Company- Philadelphia, London.

NBC 101 Nutritional Biochemistry- I 3 (2+1)

Course objectives: To be well versed with basic knowledge, concepts, and methodology related to the chemical properties of nutrients and other nutritional constituents and to their biochemical, metabolic, physiological, and epigenetic functions.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know about the metabolism of all the macronutrients.

- Able to estimate the serum protein, blood glucose and other constituents.
- Know about the interrelationship between biochemistry and other biological science.

Theory

Introduction to biochemistry - Definition, objectives, scope and inter relationship between biochemistry and other biological science, Enzymes - Definition, types and classification of enzymes, definition and types of coenzymes, specificity of enzymes, isozymes, enzyme, kinetics including factors affecting enzyme action, velocity of enzyme catalyzed reactions, enzyme inhibition, intermediary metabolism - Carbohydrate metabolism, glycolysis, TCA cycle and energy generation, gluconeogenesis, glycogenesis, glycogenolysis, blood sugar regulation, Lipids- Oxidation and biosynthesis of fatty acids (saturated and mono-unsaturated) - Synthesis and utilization of ketone bodies, ketosis, fatty livers, proteins - General reaction of amino acid metabolism, urea cycle, lipoproteins - Types, composition, role and significance in disease.

Practical

Handling of equipment and instruments, preparation of samples, solutions and buffers, blood constituents: Estimation of serum protein (biuret method and lowry method), blood glucose (folin Wu method), serum inorganic phosphorus (Fiske and Subba Rao method), creatinine, Urine constituents: Estimation of protein levels, glucose levels in urine, ketone bodies in urine, urine constituents- Repeat.

Suggested Reading:

West, E. S., Todd, W.R.; Mason. H.S. and Van Bruggen J.T.: 4th Ed. Text book of Biochemistry. Amerind Publishing Co. Pvt. Ltd.
 Murray, r. K. Grannen, D. K.; Mayes, P. A. and Rodwell. V. W.: Harper's biochemistry. Lange Medical Book.
 Handler, P.; Smith E.I.; Stelten, D. W. : Principles of biochemistry, Me. Grew Hill Book Co.
 Lehninger, A.L.; Nelson, D.L. and Cox, M. M. Principles of biochemistry. CBS Publishers and Distributors.
 Devlin, T. M. : Text Book of biochemistry with clinical corelations. John Wiley and Sons.
 Stryer. L. biochemistry. Freeman W.H. and Co. Assaini. J. An introduction of Practical Biochemistry : D. Plummer Practical biochemistry : K Wilson and Walker Biochemical methods : S. Sadasivan and K Manikam Hawk's physiological Chemistry : B.L. Oser (ed)
 Practical biochemistry: R. L. Nath. A treatise on Analysis of Food, Fats and Oils: A. R. Sen, N.K. Pramanik and S.K. Roy.

FFS 101 Fundamentals of Food Science 3 (2+1)

Course objectives: To be well acquainted with the physical, biological and chemical makeup of food; and the concepts underlying food processing.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know the basic composition and nutritional factors of various commonly used foods.
- The changes occurring in foods during their processing.
- Importance of various additives and spices on human health.

Theory

Cooking- Objectives, cooking methods, their types, merits and demerits. Cereals and millets- Structure, composition, processing techniques, effect of heat and acid, functions of starch in the cookery. Legumes, nuts and oil seeds - Composition, processing techniques, effect of heat, acid and alkali. Fruits and vegetables - Types, composition, pigments, changes caused by heat, acid and alkali. Milk and milk products – Composition, types, products, effect of acid on milk cookery, uses and functions. Egg - Structure, composition, grading of egg, function and changes during cooking. Meat, poultry and fish- Types, structure, composition, pigments, factors affecting tenderness, post-mortem changes and changes during cooking. Sugars- Types, composition, manufacturing process, effect of heat and acid, functions in cookery. Fats and oils - kinds, composition, effect of heat, functions in cookery, processing techniques, rancidity of fats; Brief overview of beverages; Condiments and spices, importance in daily life.

Practical

Orientation to kitchen equipment and their uses, weighing and measuring food items and identification of the food grains, condiments and spices. Introduction to cooking methods. Cereal cookery– Practical exercise on dextrinization and gelatinization of rice starch, gluten formation in wheat. Legumes – Identification and cooking methods. Nuts and oilseeds- Use in food preparations. Vegetable cookery- Different preparations with vegetables and effect of heat and alkali on pigments. Preparation of soups, salads and beverages. Milk and milk products- Use in various preparations, egg cookery - Preparations showing functions of egg, various ways of using egg. Meat, poultry and fish cookery – Preparations involving various methods of cooking. Sugar- Preparations showing functions of sugar in cookery, fats and oils – Demonstration of smoking point, use in various preparations.

Suggested Reading:

- Fox, B. F. and Cameron, A. G. (1970). Food Science - a Chemical Approach.
University Press, London
- Swaminathan, M. (1988). Handbook of Food Science and Experimental Foods
BAPPCO, Bangalore
- Shakuntala Manay N, Shadaksharaswamy M (1998). Foods, Facts and Principles,
New Age International Publishers, New Delhi

PHN 101 Principles of Human Nutrition 3 (3+0)

Course objectives: To be well versed with the role of essential nutrients in food that are necessary to support human life and health.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know about various nutraceuticals, dietary supplements, food groups etc . needed for human health.
- Understand about the digestion and absorption of carbohydrates, lipids and proteins.
- Know about various minerals, their sources, deficiency and toxicity.

Theory

Historical development and the relationship of nutrition to health, growth and human welfare. Definitions of terms used in nutrition- Recommended dietary allowances, balanced diet, health, functional foods, phytochemicals, Nutraceuticals, dietary supplements, food groups. Energy- units, sources and requirements, fuel value of foods, methods of measuring energy value of food, energy requirement of body, physical activity and thermogenic effect of food, BMR- methods of measurement, factors affecting BMR. Digestion and absorption of carbohydrates, lipids and proteins. Carbohydrates- Types,

functions, sources, requirement, health conditions affected by carbohydrates, significance of dietary fibre. Lipids- Types, functions, sources, requirement, health problems associated with lipids proteins- Types, functions, sources, requirement, quality evaluation, improvement and deficiency and protein energy malnutrition. Vitamins- Classification, functions, sources, requirement, deficiency and toxicity of fat soluble- (A, D, E, K), (water soluble- C, B Complex (thiamine, riboflavin, niacin, B6, Pantothenic acid, B12 and folic acid). Minerals- Classification, functions, sources, requirements, deficiency and toxicity of calcium, phosphorus, iodine, fluorine, iron, sodium, potassium, chloride, copper and zinc, bio availability and factors calcium and iron. Water, functions, sources, distribution in body water balance and electrolyte balance.

Suggested Readings:

- Gopalan, C., Ramsastri, B.V. and Balasubramanian, S.C. (1990). Nutritive value of Indian foods.
ICMR, (2010). Recommended dietary allowance for Indians, ICMR, Delhi.
Srilakshmi, B (2002). Nutrition science, new age Int. Ltd. Pub., New Delhi
Mudambi, S. R. and Rajagopal. M.V. (2001). Fundamentals of foods and nutrition. New Delhi, New Age International (P) Ltd. New Delhi.
Srilakshmi, B. (2005). Dietetics. New Delhi 5th edn. New Age International (P) Limited. New Delhi.

PYE 101 Physical Education & Yoga Practices 2 (0+2)

Objective: To introduce the students to yogic asanas and health improving physical exercises.

Course outcome: Upon completion of the course students will be able to;

- Realize the importance the physical exercises and yogic asanas.
- Practice various yogic asanas
- Spread awareness on the utilities of yoga.

Health, hygiene and sanitation: Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health program and reproductive health. Youth health, lifestyle, HIV AIDS and first aid, Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid

Youth and yoga: History, philosophy, concept, myths and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method, yogic asanas and practices.

Practical:

Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)

Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation

Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation

Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills,

involvement in game situation
 Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
 Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
 Teaching – Meaning, Scope and importance of Physical Education
 Teaching – Definition, Type of Tournaments
 Teaching – Physical Fitness and Health Education
 Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).
 Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation
 Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction.
 Involvement of all the skills in games situation with teaching of rules of the game
 Teaching of different track events – demonstration practice of the skills and correction with competition among them.
 Teaching of different field events – demonstration practice of the skills and correction.
 Teaching of different asanas – demonstration practice and correction.
 Teaching of weight training – demonstration practice and correction.
 Teaching of circuit training – demonstration practice and correction.
 Teaching of calisthenics – demonstration practice and correction.

Semester II

TWE 102 Technical Writing (English) 2 (1+1)

Course objectives: Train in use of English as communication language and writing technical content.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Effectively speak and write English in an academic environment.
- Reliably demonstrated the ability to use the conventions of grammar when creating paragraphs.
- Effective in comprehension of a technical writing, develop manuscripts and reports.

Theory

Nature of technical style vs. general style, writing process (prewriting, drafting, rewriting and editing). Effect of diction, sentence- structure and paragraphs on style; manuscript form, numbers, abbreviation, hyphenation of compound terms, decimal system of numbering headings, equations, documentation, sentence correction. Paragraph writing- Definition, requirements of a good paragraph (Unity, coherence and emphasis), topic sentence, various orders to develop a paragraph (Inductive, deductive, question to answer, exposition, time order, comparison and contrast, enumeration, space order). Report writing- Definition and cardinal characteristics of report, analyzing the report. Report formats- Blank form, letter form, memorandum form and general survey report. Technical correspondence- General principles of technical correspondence, parts of a letter (Heading, address, salutation, body, complimentary closing, signature), type of letters (letters giving instructions, inquiries and answers to inquiries, complaints and adjustments, letter urging action, applications and resumes). Proposal writing- Definition and kinds of proposal, division of formal proposal (Front matter, letter of transmittal,

title page, summary or abstract, table of contents, statement of request and body). Writing scientific and semi-technical articles- Source material, topic selection, literature review, tables, figures, footnotes, bibliography.

Practical

Exercise on identification of phonetic sounds, symbols, consonants, pure vowels, diphthongs, organs of speech, place of articulation and manner of articulation (Voiceless and voiced sounds). Writing of a technical report, paragraph, formal correspondence, proposal and scientific and semi-technical articles.

Suggested Readings

Strunk, Jr.; William and White, E.B. (1967). The elements of style. New York: Macmillan.
Leegget, G. C.; Mead, D. and Charvat, W. (1988). Essentials of grammar and composition. New Delhi: Prentice- Hall (Indian reprint).
Sherman, T.A. and Simon, S. J. (1990). Modern technical writing. New Jersey: Prentice-Hall.
Alvarez, J.A. (1980). The elements of technical writing. New York: Harcourt.
Connor, J.D. (1992). Better English pronunciation. New Delhi, University Book Stall.
Jones, D. and Glimson, A.C. (1997). English pronouncing dictionary, London.
Bansal, R.K. and Harrison, J.B. (1983). Spoken English, Orient Longman, New Delhi.
Krishnamohan and Banerjee, M. (1990). Developing Communication Skills. MacMillan India Ltd, New Delhi.

IRS 102 Introduction to Rural Sociology 2 (2+0)

Course objectives: To study various sociological and interdisciplinary approaches to emerging social issues and new approaches to recurring social issues affecting rural people and places

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Learn about various rural development programs.
- Know about various socio-religious beliefs and taboos.
- Learn the basic forms and changes in Indian rural institutions.

Theory

Rural sociology- Meaning, scope and significance. Structural differentiation in terms of difference and characteristics of rural and urban societies. Planned social change - Approaches to rural planning, improvement and transformation. Indian rural development programs (IRDPs). Indian rural social stratification: Castes- Basic notions, changes and its role in economy and policy, difference between caste and class, backward classes and implementations of constitutional provisions. Indian rural institutions: Social- Family and marriage (Nature, forms and changes), Economic-political: Land relations and changes; rural poverty: its manifestations and causes. Socio-religious: Functional significance of beliefs, traditions and customs. Rural social changes - Processes and factors of transformation. Status of women in rural India and their role in rural and agricultural development.

Suggested Readings

Chitambar, J.B. (1973). Introductory rural sociology. New York, John Wiley and Sons.
Desai, A.R. (1978). Rural sociology in India. Bombay, Popular Prakashan, 5th Rev. ed.
Doshi, S.L. (2007). Rural sociology. Delhi Rawat Publishers.
Jayapalan, N. (2002). Rural sociology. New Delhi, Altanic Publishers.

Sharma, K.L. (1997). Rural society in India. Delhi, Rawat Publishers.

NBC 102 Nutritional Biochemistry - II 3(3+0)

Course objectives: To be well versed with various processes, functions and mechanisms of biomolecules at molecular level.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know about the process of transcription and translation.
- Know about various vitamins and minerals and their roles in human health.

Theory

Molecular aspects of transport, passive diffusion, facilitated diffusion, active transport. Introduction to nucleic acids- DNA, RNA - Structure, replication, transcription, genetic code (in brief) elementary knowledge of biosynthesis of proteins. Vitamins - Chemistry and biochemical role of fatsoluble vitamins - A, D, E and K, water soluble vitamins – B₁, B₂, B₆, niacin and vitamin C, minerals – calcium, iron, magnesium, sodium, potassium, iodine, Trace minerals – zinc, copper, chromium, selenium, biochemical role of inorganic elements.

Suggested Reading:

West, E. S., Todd, W. R.; Mason. H.S. and Van Bruggen J.T.: 4th Ed. Text book of biochemistry. Amerind Publishing Co. Pvt. Ltd.
Murray, R. K. Grannen, D. K.; Mayes, P. A. and Rodwell. V. W.: Harper's biochemistry. Lange Medical Book.

MCK 102 Methods of Cookery 3 (2+1)

Course objectives: to understand various basic chemical process of mixing ingredients with the application and withdrawal of heat to make it more easily digestible, palatable and safe for human consumption.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know various methods of cooking and effect of cooking on nutritional status.
- Learn about various flavoring and garnishing substances.
- Learn about various principles and practices of boiling, frying, stewing etc.

Theory

Kitchen attire and equipment's, cooking of food, heat and heat transfer cooking methods, effect of cooking on food and their nutritive value, basics of culinary practice, thickening and binding agents, basic flavoring stocks essence and glazes sauces soups garnishes, basics of cookery of various food - cereals, pulses, egg, fish, meat and poultry, principles and practice of boiling, steaming, frying, stewing, roasting, baking, grilling and combined methods of cookery

Practical

Preparation of recipes from different food groups such as cereals, pulses, eggs, vegetables, fruits and milk Preparation of food product using various cooking method: Boiling, steaming, frying, stewing, roasting, baking, grilling and combined methods of cookery.

Suggested Readings:

Fuller J. (1966). Chefs manual and kitchen management, B.T. Badtsford Ltd.

Treat N. and Richard S. (1977). Quantity cookery. Little brown and Co.

Klest, B.B., Wood, L., Horger, V.F. and Shugart G.S. (1977) Food Service in Institutions, John Kliley and Sons.

Srilakshmi, B. (2010). Food Science. 5th edn. New Age International. Pvt. Limited.

Swaminathan, M.S. (1993) Food science and experimental foods. Ganesh.

ECM 102 Economics and Marketing3 (2+1)

Course objectives: To understand principles econometric applied in agri-produce and their market mechanisms.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Comprehend the economic growth of the country.
- Prepare a business model and project relevant to entrepreneurship.
- Perform the SWOT analysis of business model.

Theory

Terms and definitions in Economics; Consumption, demand and supply. Factors affecting production. Gross Domestic Product (GDP) – Role of poultry sector in National GDP. Marketing- Definition, marketing process, need for marketing, role of marketing, marketing functions, classification of markets, marketing of various channels, price spread, marketing efficiency, integration, constraints in marketing of agricultural produce, market intelligence, bank norms, insurance, SWOT analysis, crisis management. Techno-economic parameters for preparation of projects and basic guidelines for preparation of project report.

Practical

Techno-economic parameters for preparation of project. Preparation of bankable projects for various agricultural products and its value added products. Identification of marketing channel, calculation of price spread, identification of market structure and visit to different markets.

FOA 102 Food Analysis 4 (2+2)

Course objectives: To learn about the development, application and study of analytical procedures for characterizing the properties of various foods and their constituents.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know various methods for quality control.
- Learn about various methods of food analysis.
- Learn various methods to quantify carbohydrates, proteins and fats.
- Quantify vitamins using HPLC.

Theory

Introduction to food analysis- definition, Reasons for food analysis, official methods, Rules and regulation for food analysis and importance of food analysis in quality control, Sample and sampling

techniques, familiarization to terms and calculations used in preparation of various standard solutions, principles, techniques and applications of colorimetric and spectrophotometer, analysis of carbohydrates- introduction, methods of analysis, sample preparation, extraction of monosaccharide's, oligosaccharides, chemical methods for carbohydrates analysis gravimetric methods, titrimetric methods and colorimetric methods, enzymatic methods, analysis of polysaccharides- starch, crude fiber and dietary fiber, analysis of moisture importance of moisture analysis- methods of analysis direct methods, evaporation methods, analysis of moisture - indirect methods, chemical and distillation methods, analysis of moisture – instrumental methods, analysis of proteins – importance of protein analysis, protein analysis by Kjeldhal, dumas, biuret, Lowry, Dye binding, turbid and UV visible spectroscopy methods, analysis of amino acids- Characterization, basic principles of chromatography, types of chromatography and its applications, Analysis of fats- by solvent, non-solvent and instrumental methods, analysis of composition fats and its physical parameters, Analysis of anti-nutritional factors- characterization, basic principles -tannins, phytates, oxalates etc. Principles, techniques and applications of HPLC, TLC, Analysis of ash- introduction and importance, dry ashing, wet ashing and low plasma temperature ashing, Analysis of different minerals by gravimetric and titration methods, principles, techniques and applications of AAS and AES, PH meter, electrophoresis, introduction to animal assay. principles, techniques and applications of colour estimating instruments.

Practical

Introduction to glassware's used in laboratory, preparation of samples and preparation of solutions buffers, estimation of moisture in food stuffs, estimation of bulk density of foods, estimation of colour using spectrophotometer, physical analysis-specific gravity, quantitative estimation of proximate principles- Ash, minerals, free fatty acids, protein, estimation of sugars- reducing and non-reducing , estimation of starch digestibility, quantitative estimation of vitamins by use of colorimetry, quantitative estimation of minerals by use of UV spectrophotometer, quantitative estimation of amino acids by use of paper chromatography, quantitative estimation of vitamins by use of HPLC, quantitative estimation of fatty acids by use of GC, quantitative estimation of pesticide residues by use of GC, quantitative estimation of minerals by use of atomic absorption spectrophotometer, quantitative estimation of minerals and vitamins by use of photo fluorometry, estimation of food adulteration , estimation of food adulteration.

Suggested Reading:

- AOAC (1995). Association of official analytical chemists. Washington, DC.
Gruenwedels DW and whitakor JR (1984). Food analysis: Principles and techniques. Vols. I-VIII. Marcel Dekker.
Joslyn MA. (1970). Methods in food analysis: Physical, chemical and instrumental Methods of analysis. academic Press.
Pomeranz Y and Molean CE. (1977). Food analysis theory and practice. AVIPubl.
Sawhney SK and Singh R. (2000). Introductory practical biochemistry. Narosa.

FPS 102 Food Preservation and Storage 4 (2+2)

Course objectives: To be well versed with various techniques to process, treat and handle food to stop or slow down food spoilage, loss of quality, edibility, or nutritional value and thus allow for longer food storage.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know the principles of food storage.
- Learn about various novel methods of food preservations.

- Know about various packaging materials and cost analysis.

Theory

Indian and global scenario on food production and processing- quality requirement of raw material for processing plants primary processing secondary processing -storage changes in grains- food spoilage-causes and factors effecting, chemical nature. principle methods of food preservation- drying and dehydration, use of high temperature, use of salt, use of sugar, use of low temperature, preservative-food material as preservatives, use of chemicals, radiation, combination of above methods-changes in constituents, preservation by concentration, recent methods in preservation, effect of food processing and preservation on the nutritive value of foods, Traditional methods of storage and preservation, food flavours, importance of storage of semi perishable and non-perishable foods - packaging and packaging material, labelling and costing of the product

Practical

Market survey of raw and preserved foods. Preparation of preserved products. Squash, cordial, crush, jams, jellies, marmalade, candy, preserves, murabbas, pickles with and without oil, chutneys, ketchup, sauces, candies, toffees, cheese and syrup. Shelf life and sensory evaluation of developed products Demonstration on canning and bottling of fruits and vegetables. Demonstration on storage of food grains. Visits to food processing and preservation units, canning and bottling units, grain storage institute dairy plant and FCI godown.

Suggested Readings:

- Potter, N.N. (1996). Food Science. The AVI Publishing Company, Inc., Westport, Connecticut.
- Sehgal, S., Grewal, R.B., Kawatra, A. and Kaur, Y. (1997). Practical Aspects of Food Preservation. Directorate of Publications. Haryana Agricultural University, Hisar.
- Vijay K., (1999), Text book of Food, Storage and Preservation, Kalyani Publishers, New Dehi.
- Kalia, M. and Sood, S. (2010). Food Preservation and Processing. Revised Edition, Kalyani Publishers, New Delhi.
- Jood, S. and Khetarpaul, N. (2002). Food Preservation. Geeta Somani Agrotech Publishing Academy, Udaipur.
- Sivasankar, B. (2002). Food Processing and Preservation. PHI Learning Pvt. Ltd. Delhi.

Semester III

EST 103 Elementary Statistics 3 (2+1)

Course objectives: To be well versed with the various statistical methods and designs for collection, analysis and representation of data.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Measure the central tendency in a collected data.
- Measure skewness and kurtosis.
- Learn about the test of significance.
- Learn about the measure of variance.

Theory

Introduction to statistics, definitions, functions, uses and limitations classification and tabulation of data, qualitative and quantitative classification, discrete and continuous variables, frequency tables, grouped and ungrouped data. Diagrammatic representation of data, one, two and three dimensional diagrams with applications. Graphical representation of data, histogram, frequency polygon, frequency curve, ogives. Measures of central tendency, introduction to basic concepts of logarithms, AM, GM, HM, median, mode with merits, demerits and uses, relationship between AM, GM and HM, quartile deviation, mean deviation from AM, median and mode, variance, standard deviation, coefficient of variation. Measures of dispersion, range coefficients, inter quartile range, quartile deviation, coefficient of quartile deviation, mean deviation from AM, median and mode, variance, standard deviation, coefficient variation. Moments, raw moments, central moments for grouped and ungrouped data, relationship between raw moments and central moments. Measures of skewness and kurtosis, definitions of symmetrical distribution, skewness and kurtosis, relationship between mean, median and mode and between quartiles for symmetrical and skewed distributions. Probability theory, introduction to simple problems of permutations and combinations, definition of random experiment sample space, events, mutually exclusive and equally likely events. Definition of probability, simple problems based on probability, addition and multiplication theorem of probability, conditional events and independent events, correlation and linear regression analysis, definition of correlation its types, scatter diagrams, karl pearson's formula of correlation coefficients, properties of correlation coefficient, definition of regression, regression equations of Y on X and of X on Y, relationship between correlation coefficient and regression coefficients. Problems based on correlation and regression. Tests of significance, basic definitions, hypothesis, null and alternative hypothesis, tests statistic, testing of hypothesis, one sample t-test and two sample fisher's t-test. Chi-square test of goodness of fit and Chi-square test of independence of attributes. Discrete and continuous probability distributions, definition of random variable, discrete and continuous random variables probability distribution of random variable, concepts of discrete and continuous probability distribution, basic concept of binomial theorem, binomial distribution, Poisson distribution, normal distribution and applications. Analysis of variance, definition of analysis of variance, assignable and non-assignable factors, analysis of one way classified data. Introduction to sampling methods, definition of population, random sample, sampling versus complete enumeration, use of random number table for selecting a simple random sample, simple random sampling with and without replacements.

Practical

Graphical representation of data Diagrammatic representation of data. Measures of central tendency (Ungrouped and grouped data) with calculation of quartiles, deciles and percentiles. Measures of dispersion (Ungrouped and grouped data). Moments, measures of skewness and kurtosis (Ungrouped and grouped data), Moments, measures of skewness and kurtosis (Ungrouped and grouped data). Correlation and regression analysis one sample t-test. Application of two sample Fisher's t-test Chi-square test of goodness of fit Chi-square test of independence of attributes Analysis of variance one-way classification. Selection of random sample using simple random sampling.

Suggested Readings:

Elhance, D. N. Fundamentals of Statistics
Agarwal, B. L. Basic Statistics
Singh and Verma Agricultural Statistics
Kapoor and Saxena Mathematical Statistics
Hall and Knight Higher Algebra

Course objectives: To be acquainted with various microorganisms associated with food spoilage and their management.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know various factors associated with the buildup of microorganisms.
- Know about the principles of controlling those microorganisms.
- Learn about various sources of contamination and prevention.

Theory

Basic aspects and scope of food microbiology; Intrinsic and extrinsic factors that affect microbial growth in foods. Microbial spoilage of fruits, fruit juices, vegetables, cereals, meat, poultry, sea foods, carbonated soft drinks, canned foods; chemical changes caused by microorganisms; control of spoilage. Food preservation - Physical methods. Chemical preservatives and natural antimicrobial compounds, biology based preservation system. Control of microorganisms by use of low and high temperature, asepsis, water activity, drying, preservatives, radiation and pressure for control of microorganisms; Microbiology of milk and milk products; Sources of contamination, spoilage and prevention; Microbiology of fruits and vegetables; cereal and cereal products; meat and meat products; fish and other sea foods; poultry and eggs; sugar and sugar products; salts and spices; contamination, spoilage and prevention.

Practical

Changes in practices: General laboratory practices in microbiology laboratory, Equipment used in food microbiology laboratory, Aseptic methods, Sterilization methods, Morphological studies, Preparation of media, Isolation and enrichment of microorganisms, Microbial analysis of food products and water. Isolation of molds from foods. Microbial examination of cereal and cereal products, vegetable and fruits, meat and meat products, fish and other sea foods, Eggs and poultry, milk and milk products; sugar, salts and spices.

Suggested Reading:

- Banawart GJ. (1989). Basic food microbiology. 2nd Ed. AVI Publ.
Frazier J and Westhoff DC. (1988). Food microbiology. 4th Ed. McGraw Hill.
Garbutt J. (1997). Essentials of food microbiology. Arnold Heinemann.
Jay JM, Loessner MJ and Golden DA. (2005). Modern food microbiology. 7th Ed. Springer.
Ray B. (2004). Fundamentals of food microbiology. 3rd Ed. CRC.
Robinson RK. (Ed.). (1983). Dairy microbiology. Applied Science.
Steinkraus KS. (1996). Handbook of Indigenous Fermented Foods. Marcel Dekker.

ICN 103 Introduction to Clinical Nutrition 4 (3+1)

Course objectives: To know about the scientific fields of nutrition and dietetics keeping a healthy energy balance in patients, providing sufficient amounts other nutrients such as protein, vitamins, minerals.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Able to diagnose disease relevant to food.
- Keep record of health related to food habits.
- Able to recommend diagnosis based drug therapy and assess the response factor.

Theory

Metabolic changes and clinical diagnosis in various diseases. Nutrient deficiency diseases. Anaemia, vitamin B complex deficiencies, Vitamin A deficiency disease, Iodine deficiency disorders, Calcium and vitamin D deficiency diseases, ascorbic acid deficiency. Metabolic changes and clinical diagnosis in degenerative diseases: Diabetes, Cardiovascular diseases, renal disorder, liver diseases, cancer. Interpretation of report of blood and urine in different disease conditions. Drug and nutrient interaction, effect of drugs on nutritional status. Effect of diet and nutritional status on drug effectiveness.

Practical

Identification and interpretation of clinical signs of nutritional deficiency diseases sampling of blood and urine for nutritional status estimation of haemoglobin. Estimation of glucose in blood and urine in normal and diabetic persons. Estimation of lipid profile in normal and heart patients. Estimation of serum retinol total protein and serum albumin visit to a clinical laboratory.

Suggested Readings:

- Lee, R.D. and Nieman, D.C. (1993). Nutritional assessment. Pub. Brown and Benchmark, USA.
- Pathak, N.N. (1997). Analytical techniques in clinical nutrition (manual); Centre of Advanced Studies in animal nutrition IVRI, Izatnagar.
- Oser, B.L. (1979). Hawk's physiological chemistry. Tata Mc Graw Hill Pub. Co. Ltd., New Delhi
- American Journal of Clinical Nutrition.

NLC 103 Nutrition Through Life Cycle 3 (2+1)

Course objectives: To provide comprehensive knowledge on the influence of food and nutrition considering a life cycle.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Able to explain the impact food habits, quality and nutritional value in relation to healthy lifestyle.
- Able to delineate the disorder related to food and nutritional deficiencies.

Theory

Infancy- Role of nutrition on physical and mental development, rate of growth-weight as an indicator, assessment of growth, nutrient requirement during infancy, feeding of infants, value of breast feeding on infants, breast feeding versus artificial feeding, types of milk and their use in infant feeding, Weaning and supplementary foods, weaning practices in community, feeding of premature and low-birth-weight infants. Nutritional disorders and common ailments in infancy, feeding the sick child, immunization schedule and growth charts Preschool age: Physical growth and mental development, prevalence of malnutrition in preschool years and food habits, nutritional requirements during preschool age and supplementary foods School age. Physical growth and mental development, nutritional requirements during school age, specific problems, specific problems in feeding school children Adolescence. Physical and physiological changes, nutritional requirements, food preferences and nutritional problems, problems, growth spurt and nutrition, adolescent fads influencing nutrition. Adulthood, Sex, occupation and income, nutritional requirements, biological and nutritional consequences and complications due

to pollutants, vegetarianism. Nutrition, work capacity and physical fitness. Nutrition, infection and immunity, nutrients and drugs interaction. Pregnancy. Physiological changes in pregnancy, weight gain during pregnancy, food and nutrient requirements. Complications of pregnancy and their nutritional management, impact of nutrition on the outcome of pregnancy. Nutritional need of fetus during different stages of fetal cell growth and maternal nutritional needs. Psycho-physiology of lactation; milk synthesis and secretion, maternal needs during lactation, composition of colostrums and mature human milk, milk of mothers of pre-term babies. Non- nutritional factors of human milk; immunological factors, enzymes, hormones. Human milk banking. Elderly. Physical and physiological changes, nutritional requirements, problems of old age, nutrients influencing aging process

Practical

Grouping of foods based on richness of nutrients and quantifying foods to give uniform content of each nutrient. Planning and formulation of food exchange lists. Planning, preparation and evaluation of diet for adult men and women involved in different activities. Planning, preparation and evaluation of diets for pregnant women, lactating mothers, weaning and supplementary foods for infants, preschool children, school going children, packed lunches for preschoolers and school children, adolescent boys and girls, elderly, preschool children with pem and vitamin. A deficiency Planning diets for anaemic children, adolescents and pregnant women.

Suggested Readings:

Moris, E.S. (1994). Modern nutrition in health and disease. Leaned Febin,ger, USA
Srilakshmi, B. (1995). Dietetics. Newage international publishers, New Delhi.
Corinne H.R, Marilyn R. L, Wanda L. C and E. Garwick. (1982). Normal and therapeutic nutrition. (pp- 1-16). New York, Macmillan Publishing Company.
Williams, S.R.; Worthington, R.S.; Sneholinka, E.D.; Pipes, P.; Ress, J.M. and Mahal, K.L. (1988). Introduction to nutrition throughout the life cycle. Times Mirroe/Mosby College Publishers.

CMN 103 Community Nutrition 4 (2+2)

Course objectives: To provide insights on the community scale food habit in relation traditional and cultural difference in food types.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Able to classify the food habits of community in relation to age groups and lifestyle.
- Able understand national programs directed to manage the malnutrition.

Theory

Basic concept of community nutrition role of nutritionist in improving nutrition in community Food habits and influencing factors, Food taboos Mortality and morbidity pattern of vulnerable groups and their causes. Nutritional needs of normal infants, pre-lacteal feeding, exclusive breast feeding, feeding of full term and premature infants. Importance of breast feeding and supplementary foods in combating malnutrition in infants and young children. Growth monitoring Malnutrition. Definition and causes, classification of grades of malnutrition. Assessment of nutritional status. Major nutritional problems in community. National programs and policies for improving nutritional status of community. Role of national and international agencies in improving nutritional status of the community. Nutrition education: Objectives, methods, channels and its role in control of malnutrition in community.

Practical

Assessment of nutritional status of an individual/community using anthropometry and dietary survey Visit to local health centers to identify clinical signs and symptoms of nutritional problems Visit to Anganwadi centres and evaluation of feeding provided at these centres. Development of audio-visual aids planning, implementation and evaluation of nutrition education program for a target group.

Suggested Readings:

- Sehgal, S. and Raghuvanshi, R.S. (2007). Textbook of community nutrition, Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi.
- Latham, M.C. (1997). Human nutrition in the developing world. Food and agricultural organization of United Nations.
- Srilakshmi, B. (2012). Nutrition science, New Age International Pvt. Ltd. Publishers. New Delhi.
- Srilakshmi, B. (2012). Dietetics, New age international Pvt. Ltd. Publishers. New Delhi.
- Dahiya, S., Boora, P. and Rani, V. (2013) A manual on Community nutrition, Deptt. of Foods and Nutrition, published under ICAR, Assistance scheme.
- Bamji, S.M., Rao, N.P., Reddy, V. (1996) Textbook of human nutrition. Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
- Swaminathan, M. (1985). Essentials of food and nutrition. 2nd edition, Vol. II. The Bangalore printing and publishing company Ltd. Bangalore.

CMU 103 Cereals and Millets: Preparation and Utilization 3(2+1)

Course objectives: To be well versed with the preparation and utilization of cereal and millet products.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know the flour treatment and processing.
- Know the physico-chemical properties of grains.
- Practice the commercial preparation of flakes and syrup.

Theory

Major cereals and millets of India, structure and composition of cereal grains, storage of cereals, Suitability of commercial grains for processing, evaluation of varietal differences Wheat types and wheat hardness - Soft wheat, hard wheat, durum wheat. Wheat milling operations, commercial roller flour milling, air classification Suitability of wheat flour for particular end use, flour treatments, gluten and functionality, dough rheology, bread quality, wheat products Rice- Structure and composition, rice milling, milled rice, ageing of rice, parboiling of paddy, cooking of rice, processed rice products and by-products, fermented rice products Maize and sorghum- Structure, composition, milling Barley, oat and millets- Structure, composition, malting, milling by products utilization of all commercial grains. Preparation of flakes, starch, syrup, germ oil and steep liquor.

Practical

Physico-chemical properties of grains. Quality test of rice – amylase content determination.

Estimation of gluten content. Rheological tests- Mixograph, farinograph, alveograph, extensograph. Chemical tests- Sedimentation test, flour swelling volume, starch gelatinization, paste viscosity properties. Preparation of wheat products- Bread and biscuits. Preparation of fermented rice products. Visit to flour mills, rice mills, bakery units.

Suggested Readings:

Khader, V. (2001). Text book of food science and technology. Directorate of information and Publications of Agriculture, ICAR, Krishi Anusandhan Bhawan, Pusa, New Delhi
Srilakshmi B. (2001). Food science. New Age International Pvt. Ltd. New Delhi
Salunkhe, D. and Deshpande, S.S. (1991) Foods of plant origin: Production, technology and human nutrition. The AVI Publishing Inc. New York
Ram, S and Mishra, B. (2010) Cereals-processing and nutritional quality. New India Publishing Agency, Pitam Pura, New Delhi
Potty, V.H. and Mulky, M.J. (1993). Food processing. Oxford and IBH.
Fellow, P.J. (2009) Food processing Technology 3rd Ed. Wood Publishing Ltd. Cambridge England.
Manay N.S and Shadaksharaswamy, M. (2001). Foods facts and principles. Wiley Eastern Ltd. New Delhi, Bangalore, Bombay, Calcutta, Hyderabad

FSM 103 Food Service Management- I 2 (2+0)

Course objectives: To provide knowledge on food and hospitality industry.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Able to describe the development of food and hospitality industry.
- Able to group the type and classify the infrastructure and instruments relevant to hospitality industry.
- Able to understand the laws governing the price, book keeping and hygiene.

Theory

Development and types of food service institutions, historical development. Management, organization and administration of a food service establishment. Organization of kitchen, storage and service areas, layout designs. Equipment's- Classification, selection, operation, purchasing, care and maintenance. Food purchasing, receiving, storage, menu planning, food production and service. Financial management- Cost concepts, food cost control, pricing, book-keeping, accounting. Personnel management- Policies, recruitment, selection, facilities, benefits, trainings and development. Sanitation, hygiene and safety in food service establishment. Laws governing food service establishments, legal issues. Current issues.

Suggested readings:

Chakrabarty MM. 2003. Chemistry and Technology of Oils and Fats. Prentice Hall.
Dendy DAV & Dobraszczyk BJ. 2001. Cereal and Cereal Products. Aspen.
Hamilton RJ & Bhati A. 1980. Fats and Oils - Chemistry and Technology. App. Sci. Publ.
Hoseney RS. 1994. Principles of Cereal Science and Technology. 2nd Ed. AACC.
Kay DE. 1979. Food Legumes. Tropical Products Institute.
Kent NL. 1983. Technology of Cereals. 4th Ed. Pergamon Press.
Kulp K & Ponte GJ. 2000. Handbook of Cereal Science and Technology. 2nd

Ed. Marcel Dekker.
Lorenz KL.1991. Handbook of Cereal Science and Technology. Marcel Dekker.
Marshall WE & Wadsworth JI. 1994. Rice Science and Technology. Marcel Dekker.
Mathews RH. 1989. Legumes Chemistry, Technology and Human Nutrition. Marcel Dekker.
Matz SA. 1969. Cereal Science. AVIPubl.
Paquot C. 1979. Standard Methods of Analysis of Oils, Fats and Derivatives. Pergamon Press.
Pomeranz Y. 1987. Modern Cereal Science & Technology. VCH Publ.
Salunkhe DK.1992. World Oilseeds: Chemistry, Technology and Utilization. VNR. Swern D.
1964. Bailey's Industrial Oil and Fat Products
Sethi and Malhan. (1993) Catering management: An integrated approach. Wiley Eastern.
West, Wood and Hanger. Food Service in institutions. John Wiley and Sons, Inc.
Hoboken, New Jersey.

Semester IV

CPD 104 Communication Skills and Personality Development 3 (2+1)

Course objectives: To be well versed and hand in training with the skills and techniques for effective transfer and receiving information. This course also emphasizes on building personality.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know the techniques of individual and group communication.
- Know the recent advances in communication technology.
- Know and practice the behavioural traits and human personality pattern.

Theory

Communication skills- Process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Role of ICT in communication. Recent advances in communication- Print and electronic, internet, e-mail, fax, mobile, interactive video and teleconferencing, computer, e-governance.

Meaning and definition of personality; Theoretical perspectives on personality- Behavioural trait and humanistic personality pattern; moulding the personality patterns. Personality development- Self perception, self concept, self esteem and gender stereotyping, persistence and changes in personality determinants (physical, intellectual, emotional, social, educational and family). Aspirations, achievements and fulfillment. Dressing for formal and informal occasions

Practical

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations. Developing questionnaire to study impact of physique, educational institutions, aspirations on personality; developing questionnaire to study social prescriptions, gender and family on personality, aspirations and achievements. Collecting data through the questionnaires on small samples. Report writing and

presentation. Case study of an individual suffering with personality disorders.

FPF 104 Food Product Development and Formulations 2 (1+1)

Course objectives: To provide insights on the process involved in food creation and maintenance of nutritional value

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Able to identify the critical process involved in creation of food types.
- Gained knowledge on the quality control and product formulation.
- Ability design the packaging, labeling and quality standard guidelines.

Theory

Basic principles of food product development Sensory properties of food and their role in product development Bulk food preparation for food institutions and enterprises: Servings, nutritive value and costing Evaluation of food: Objective and subjective methods, selection and training of judges, Development of score cards and analysis of data Consumer evaluation: development of schedule and data analysis. Packaging materials and labeling Food safety and quality control issues in product development, food quality regulations and standards, quality control and HACCP Product formulation and development for general and therapeutic use.

Practical

Sensory evaluation: Methods, training of judges, score card preparation Selection and modification of food products to be developed, formulation and standardization of products, objective and subjective evaluation of the products, evaluation of consumer acceptability, packaging and sale of products, presentation of developed food products, Video shooting of product preparation.

Suggested Readings:

- Altschul A., M. (1993). Low calorie foods. Marcel Dekker.
- Goldberg, I. (1994). Functional foods: Designer foods, Pharma Foods, Nutraceuticals. Springer.
- Matz, S.A. (2004). Formulating and processing of dietetic foods. CHIPS Publ.
- Kalia, M. and Sood, S. (2010). Food preservation and processing. Revised edition, Kalyani Publishers, New Delhi.
- Srilakshmi, B. (2010). Food science (Fifth ed.) New Age International Pvt. Limited, Pub., New Delhi.
- Gordon, W.F. (2011). New food product development: From concept to market place (third edition). CPR, Press.

FVU 104 Fruits and Vegetables: Preparation and Utilization –I 2 (1+1)

Course objectives: To be hand in training with the preparation of various fruits and vegetable processed products.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know various principles involved in preservation of fruits and vegetables.
- Prepare various carbonated and non-alcoholic beverages.
- Know about the wine and fermentation technology.

Theory

Importance and scope of fruits and vegetables in human diet Harvesting and processing of fruits and vegetables Selection and purchase of fruits and vegetables for preservation General principles involved in preservation of fruit and vegetables products Processed fruit and vegetable products. Specification of processed products Post-harvest practices and changes Carbonated beverages, non-alcoholic beverages and fruit juice concentrates Pickles, vinegar, tea, coffee and cocoa products Wine and fermentation technology.

Practical

Evaluation of pectin grade; Canning of mango/guava/papaya; Preparation and quality evaluation of fruit jam with fruits of regional importance; Preparation and quality evaluation of fruit jelly with fruits of regional importance; Preparation and quality evaluation of fruit marmalade; Preparation and quality evaluation of fruit preserve and candy; Preparation and quality evaluation of fruit RTS; Preparation and quality evaluation of squash/syrup; Preparation of grape raisin/dried fig / dried banana; Processing of tomato products; Preparation and evaluation of dehydrated vegetables; Preparation and quality evaluation of wafers with vegetables/tubers; Preparation of fruit cheese; Preparation of pickle/mixed pickle; Preparation of dried ginger/mango powder (amchur); Final practical examination

Suggested Reading:

- Barret DM, Somogyi LP and Ramaswamy H. 2005. Processing of Fruits. CRC Press
 FAO. 2007. Handling and Preservation of Fruits and Vegetables by Combined Methods for Rural Areas- Technical Manual. FAO Agr. Ser. Bull., 149.
 Fellows P. 2007. Guidelines for Small-Scale Fruit and Vegetables Processors. FAO Agr. Ser. Bull., 127.
 Kalia, M. and Sood, S. 2010. Food Preservation and Processing. Revised edition, Kalyani Publishers, New Delhi.
 Lal G, Siddappa GS and Tandon GL. 1998. Preservation of Fruits and Vegetables. ICAR.
 Salunkhe DK and Kadam SS. 1995. Handbook of Fruit Science and Technology: Production, Composition and Processing. Marce
 Sivasankar, B. 2002. Food Processing and Preservation. PHI Learning Pvt. Ltd.
 Singh, I. S. 2009. Post-harvest handling and processing of fruits and vegetables. Westville Publishing House, New Delhi.

NNP 104 Normal Nutrition and Meal Planning 3 (2+1)

Course objectives: To provide insights on the balanced and nutritional meal plan based on food habits.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Able create a healthy meal plan.
- Able to understand the RDA specification relevant to food nutrition.

- Able to recommend food for various age groups

Theory

Basic principles of menu planning, planning menus for individual and family. Classification of vegetarianism. Factors influencing food intake and food habits. Basic principles of meal planning, planning meals for individual and family. Factors affecting food requirements of individuals, families and different groups of people. Meal planning for special occasions. Steps involved in meal planning. Food groups and their use in meal planning. Recommended dietary allowances of macro and micro nutrients for different age groups. Food exchange list. Use of food exchange list in diet planning, planning breakfast, lunch, tea, dinner, packed lunch and snacks; considering RDA for individuals. Importance of balanced diets. Food and nutrient requirement of adults (male and female of all activities level), pregnant women, lactating women, infants and normal infants. Breast feeding, advantages of breast feeding, pre-lacteal feeding, breast feeding during illness, feeding of pre term baby, feeding problems. Weaning and complementary feeding. Food and nutrient requirement of pre-school children, school age children, adolescents, age people. physiological and psychological factors affecting the diet plan.

Practical

Standardization of serving sizes, portion, cost of locally available common foods. Planning preparation and nutrient calculation of diets of preschool children, school going children, adolescents and adults. packed lunches for school children. Practice in formal and informal table setting and table manners.

Suggested Readings:

- Robinson and Weicley, (1984). Basic Nutrition and diet Therapy. Macmillian Publishing Co. Inc. New York and London.
- Gopalan, C., Ramsastri, B.V. and Balasubramanian, S.C. (1990). Nutritive Value of Indian Foods.
- ICMR, (2010). Recommended Dietary allowance for Indians, ICMR, Delhi.
- Srilakshmi, B (2002). Nutrition science, New age Int. Ltd. Pub., New Delhi
- Joshi, S. (2000). Nutrition and dietetics. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
- Sharma S. (2006). Human nutrition and meal planning. Delhi, Jnanada Prakasham (PandD).
- Mudambi, S. R. and Rajagopal. M.V. (2001). Fundamentals of foods and nutrition. New Delhi, New Age International (P) Ltd. New Delhi.
- Srilakshmi, B. (2005). Dietetics. New Delhi 5th edn. New Age International (P) Limited. New Delhi.

MPU 104 Milk and Milk Products: Preparation and Utilization 4 (2+2)

Course objectives: To provide comprehensive knowledge on nutritive value of milk and processed milk products.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Able to analyze quality parameters of milk.
- Gained knowledge on the preservation, processing and quality control of processed milk products.
- Gained knowledge on the Indian standards of various milk products.

Theory

Introduction, importance and scope of fluid milk industry in India and abroad: Brief history and present status. Composition of milk, nutritive value of milk of cow and buffalo. Physico-chemical properties of milk and milk constituents: Physical state, acidity, pH, density and specific gravity, freezing point, colour and flavor. Microbiology of milk. Types of microorganisms, their production and consequent results in milk production. Types of milk_ Sterilized Milk; Homogenized Milk; Flavoured Milks; Standardized Milk; Reconstituted/Re-hydrated Milk; Recombined Milk; Toned Milk. Milk products- traditional products- butter, ghee, khoa, cheese in theory. Steps of milk processing: collection, chilling, standardization, pasteurization, homogenization, bactofugation, and principles of dehydration. Management of processing plant: Various kinds of designs and layouts of plants Value addition for fluid milk. Waste management Quality control aspects of milk: Status of antibiotics, pesticides, heavy metals etc., Good manufacturing practices, implementation of HACCP standards, cleaning and sanitization of fluid plant: Indian standards for milk and milk products as per PFA, BIS, AGMARK etc., cleaning and sanitization procedures. Judging and grading of milk, defects in milk, their causes and prevention.

Practical

Sampling of milk. Estimation of fat, SNF, TS platform tests. Cream separation. Detection of adulterants Microbiological quality evaluation of milk and milk products Preparation of milk products. Paneer, channa, icecream, khoa, burfi, flavoured milk, rasogulla. Visit to modern milk processing and manufacturing plants.

Suggested Readings:

- Aneja R.P., Mathur B.N., Chandan, R.C., and Banerjee, A.K. (2002) Technology of Indian milk products. Dairy India Yearbook
- Jenness, R. and Patton S. (1959) Principles of Dairy Chemistry
- Lampert, L.M. (1970) Modern dairy products. Chemical Publishing Company Inc. New York
- Srinivasan, M. R. and Anantkrishanan C.P. (1964) Milk Products of India
- Sukumar, De. (2001). Out lines of dairy technology Oxford Uni. Press New Delhi

PNT 104 Public Health Nutrition 4 (3+1)

Course objectives: To provide insights on awareness to promote good health through nutrition and the primary prevention of nutrition related illness in the population.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained knowledge on public health systems of India.
- Able to understand various national programs implemented to overcome health condition
- relevant to the food and nutrition.
- Gained the knowledge on the health policy of India.

Theory

Scope of public health. Public health problems of India, nutrient deficiency diseases and other diseases, their etiology, prevalence and prevention. The basic concept of health, health as a human right, national health policy and national nutritional policy. National programs relevant for public health. Vitamin A deficiency disorder control program. National diarrhoeal disease program, national iodine deficiency. Disorder

control programme, iron deficiency, anemia prophylaxis programme. National malaria eradication programme, national immunization programme, national programme for control of tuberculosis, national leprosy eradication programme, national aids control programme, national guinea worm eradication programme, national kala azar control programme, other health and nutrition programmes. Factors affecting implementation of programmes in rural areas. Modulating factors in nutrition for public health. Child care. Existing picture of child health, objective and imaginative approach to child care. Care of infants and women, hereditary disorders. Health problems of aged and their care. Special care and priority for mentally handicapped. Occupational health and industrial health policy. Traditional medicine, vegetarianism, health food, genetically modified foods and their relevance in human health. Epidemiology as a basis of health policy

Practical

Epidemiological approach to study individual disease in a community. Analysis of data and report writing. Discussion for preventive and therapeutic strategies. Public health campaign in a village.

Suggested Readings:

- Mukhopadhyay, A. (1992). State of India's health. Voluntary Health Association of India.
- Srilakshmi, B. (2002). Nutrition science. New Age International (P)Limited.
- McLaren, D.S. (1976). Nutrition in the community. John Wiley and Sons, London.
- DeMaeyer, E.M. (1989). Preventing and controlling iron deficiency anaemia through primary health care. A guide for health administrators and program managers. WHO, Geneva.
- WHO 2001. Assessment of iodine deficiency disorders and monitoring their elimination. A guide for program managers 2 edition.
- Meashan, A.R. and Chatterjee, M. (1999). Wasting Away: The crisis of malnutrition in India. The World Bank, Washington, D.C.
- Krishnaswamy, K. (2000). Twenty five years of National Nutrition Monitoring Bureau. NIN, Indian Council of Medical Research, Hyderabad.

FCT 104 Food Chemistry 4 (3+1)

Course objectives: To know in details about the chemical processes and interactions of all biological and non-biological components of foods.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know the chemical properties of foods.
- Know the structure and properties of chlorophyll, anthocyanins, flavonoids, Sulphur compounds etc.
- Know the details about the food additives.

Theory

Properties of foods. Solubility, vapour pressure, boiling point, freezing point, osmotic pressure, viscosity, surface tension, specific gravity, oxidation and reduction. Acids, bases and buffers. Chemical bonding, octet rule, ionic bond, covalent bond, polar and nonpolar molecules, hydrogen bond. Colloids, sols, gels, emulsions and foams. Composition of foods- classification, structure and properties of carbohydrates, proteins, lipids. Water,- physical problem, free, adsorbed and bound water; Properties of minerals and vitamins, pigments. Structure and properties of chlorophyll, anthocyanins,

flavanoids, tannins, betalains, quinones, carotenoids, myoglobin and haemoglobin. Flavour compounds, terpenoids, flavanoids, sulphur compounds and volatile flavour compounds. Enzymes, enzyme inhibitors, enzymatic browning, enzymes in food processing. Food and Food Products: Composition of beverages- hot drinks, tea, coffee, cocoa, cold drinks, soft-drinks, fruit beverages and alcoholic drinks- beer, wine etc. Classification, composition and effect of processing of fruits and vegetables. Structure, composition, processing and effects on composition of cereals, pulses and oilseeds. Composition, processing and changes in processing of milk, eggs, meat and poultry. Sugars and sweeteners, reaction of sugars, nonnutritive sweeteners. Food additives: Antioxidants, chelating agents, colouring agents, curing agents, emulsions, flavours, and flavour enhancers, humectants and anti-caking agents, leavening agents, nutrient supplements, preservatives, stabilizers, thickeners.

Practical

Basic measurements- Temperature, volume, weight, density and specific gravity Weight and volume of food stuffs- Flours, sugar, fat, eggs. Preparation of standard solutions. Percentage volume by volume, percentage weight by volume, molar, normal. Measurement of pH by pH meter and by indicators acid base and and oxidation –Reduction titrations and freezing point. Effect of kind and quantity of solutes on boiling point. Osmotic principles in fruits. Effect of acid and base on some vegetables. Flour paste, chocolates, sucrose, starch and jelly. Qualities of flour: Absorptive power, gluten and effect of other ingredients on gluten. Crystalization of sugars from syrups. Tests for unsaturation and rancidity of fats: Iodine value, acid value, saponification value, peroxide value, kreis test, TBA number, smoke point. Effect of heat on proteins.

Suggested Readings:

- Manay, N.S. and Shadaksharswamy, M. (2001). Food facts and principles, II Ed. New Age International (P)Ltd. Publishers, New Delhi.
- Aurand, L.W. and Woods A.E. (1973). Food chemistry. The AVI Publishing Company, Inc., Westport Connecticut.
- Mondy, N.I. (1980). Experimental food chemistry. AVI Publishing Company, Inc. Westport Connecticut.

Semester V

TPN 105 Therapeutic Nutrition–I 4 (2+2)

Course objectives: To provide insights on the therapeutic practices through the manipulation of nutritional value of the food.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained knowledge on curative therapeutic methods through meal planning.
- Gained knowledge on symptomatology of various food related disease symptoms.
- Able to create a therapeutic diet to overcome health issues.

Theory

Importance of therapeutic meal planning and factors to be considered in meal planning. Use of food

groups and exchange list in therapeutic meal planning. Importance and modification of normal diet to therapeutic diets – Nutrients, consistency, temperature, Methods of feeding (normal and artificial) – Oral, enteral, parenteral feeding. Causes, symptoms and dietary management in various nutritional deficiencies – Energy, protein, vitamins A, D, C and B complex, iron, calcium and zinc. Infections and fevers: Types, causes, symptoms and dietary management in acute and chronic fevers. Gastrointestinal disorders: Diarrhoea, constipation, peptic ulcers, GERD, ulcerative colitis, diverticulitis, irritable bowel disease, malabsorption syndrome. Liver and gall bladder diseases – Causes, symptoms and dietary management of Jaundice, hepatitis, cirrhosis, ascites, hepatic coma, cholelithiasis. Eating disorders – Anorexia nervosa, bulimia, underweight, overweight and obesity and problems of weight control.

Practical

Market survey for determining cost of locally available common foods; Standardization of serving sizes for different food items, portioning. Planning and preparation of soft and liquid diets, ORS and bland diet and therapeutic diets for typhoid, tuberculosis, influenza, malaria and AIDS. Planning and preparation of diets for gastrointestinal disorders i.e. diarrhoea, constipation, peptic ulcers, GERD, ulcerative colitis, diverticulitis, irritable bowel disease, malabsorption syndrome. Planning and preparation of diets for liver and gall bladder diseases i.e. Jaundice, hepatitis, cirrhosis, ascites, hepatic coma and cholelithiasis and eating disorders i.e. anorexia nervosa, bulimia, underweight, overweight and obesity and problems of weight control.

Suggested Readings:

- Antia, P. (1986). *Clinical dietetics and nutrition*. Oxford Univ. Bombay.
- Moris, E.S. (1994). *Modern nutrition in health and disease*. Leland febiger, USA.
- Srilakshmi, B. (1995). *Dietetics*. New age international publishers, New Delhi.
- Corinne H. Robinson, Marilyn R. Lawler, Wanda L. Chenoweth, Ann E. Garwick. (1982). *Normal and Therapeutic Nutrition*. (pp- 1-16). New York, Macmillan Publishing Company.
- Elia, M., Ljungqvist, O., Stratton, R. and Susan, L. (Eds.). (2012). *Clinical Nutrition*, 2nd Edition. Wiley-Blackwell
- Gopalan, C., Ramsastri, B.V. and Balasubramanian, S.C. (2012). *Nutritive value of Indian foods*.
- ICMR. (2010). *Recommended Dietary Allowances for Indians*, ICMR, Delhi.
- Joshi, S. (2000). *Nutrition and dietetics*. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

FYS 105 Food Hygiene and Sanitation 4 (2+2)

Course objectives: To provide insights on hygiene and sanitation standards of food industry.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Able to prepare the guidelines for food industry assigning quality standards.
- Gained the knowledge on environmental pollution guidelines, sanitary and regulatory laws.

Theory

Concept and significance of hygiene and sanitation in relation to food industry. Food storage general guidelines and storage of specific foods principles of hygiene and sanitation- sanitary procedures while preparation, cooking, and holding food, serving and displaying food, specific food operations. Sources of food contamination Sanitation of physical plant (premises) and sanitation of equipment- cleaning

procedures. Personal hygiene and food handling habits of personnel. Water supply sources, impurities of water. Water purification methods. Domestic and Industrial. Food and water borne infections. Prevention and control. Regulatory laws- Environmental pollution- Sanitary regulations and standards.

Practical

Identification of microorganisms, preparation of slides, preparation of media. Collection of water samples. Testing of water for: (i) Physical quality (ii) Bacteriological quality. Survey of hygienic and sanitary condition in food shops/food vendors. Visit to food industries. Report writing.

Suggested Readings:

- Bhat, RV and Rao, RN (1997). Food safety. BAPPCO Ltd., Bangalore
Hobbs, BC and Gilber RJ. (1982). Food poisoning and food hygiene. Ballantyne LTD., London.
John, N. (1995). Managing food hygiene. McMillan Press Ltd. UK
Longree, K and Arbustester G (1996). Quantity food sanitation John Wiley and Sons. New York.
OECD. (2003). Assessing microbial safety of drinking water: Improving approaches and methods. IWA publishers
Roberts, D. and Greenwood M. (2002). Practical food microbiology, 3rd Edition. Wiley- Blackwell Publishers.
Roday, S. (2012). Food hygiene and sanitation. Tata McGraw-Hill Education publishers.
The microbiological examination of foods and water. www.marietta.edu/~spilats/biol202/labexercises/9-Food_and_water.pdf
WHO, (1995). Food hygiene in catering establishments. Legislation and Model Regulation, WHO Offset publication No. 34 Geneva.

FQC 105 Foods Standards and Quality Control 4 (2+2)

Course objectives: To provide insights on food quality attributes, standards and evaluation.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained knowledge on food quality attributes and their classification.
- Gained knowledge on the food additives, preservatives and their international standards.
- Able to comprehend the food safety, quality and grade of processed foods.

Theory

Food quality and quality attributes - Classification of quality attributes and their role in food quality, objectives, importance and functions of quality control, principles of quality assurance, quality assessment of raw materials, International standards, food additives, introduction and importance, classification of preservatives, colouring agents, emulsifying and stabilizing agents, antioxidants, various methods / techniques for the assessment of quality of different foods, instrumental analysis of quality control. Different ways of testing texture of different foods, grading and marking standards and specification for finished products, food adulteration- introduction and various ways of adulteration, introduction to sensory analysis, general testing conditions, requirements of sensory laboratory, organizing sensory evaluation program, selection of sensory panelists, Factors influencing sensory measurements, Sensory quality parameters –Size, shape, texture, aroma, taste, color and gloss, threshold and dilution tests, different tests for sensory evaluation– discrimination, descriptive, affective, flavour profile and tests, ranking tests,

methods of sensory evaluation of their food products, computer-aided sensory evaluation of food and beverage, statistical analysis of sensory and objective analysis data. consumer studies and different types of consumer studies, introduction to HACCP, implementation in food industry. Food safety and quality control Food grade standards for different processed products

Practical

Sampling techniques for collection of agriculture, horticulture and animal foods. Collection of food samples from different sources, Physical examination and grading of grains, spices etc for quality, exercise on identification of basic taste- sweet, sour, salty and bitter, triangle test, Sensory evaluation techniques- duo-trio test, score card method, Sensory evaluation of a food product, Demonstration of objective tests for quality evaluation, Detection of food adulteration in grain samples and spices, oils and milk, Collection of food products with artificial colouring and checking for quality, Visit to quality control lab, foods, water.

Suggested Readings:

Carol E, Mellin; D. and Barbara A C. (1995). Food safety , food fesearch Institute, University of Wisconsin- Madison. Marcel Dekker Inc. New York.
Soharb and Shasisareen. The Food Industry- A practical guide- BIS, New Delhi, Pub by APEDA
Surveillance, Prevention and control of food contaminants, Proceedings of National Symposium, ICMR, New Delhi, 1996

SNF 105 Sports Nutrition and Physical Fitness 3 (2+1)

Course objectives: To provide insights on the food and nutritional value of food specific to sports and physical fitness.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained the knowledge on the balanced nutritional requirements of sports and physical fitness.
- Able to comprehend the role of various components of food items on metabolism of sports person and/or physical health.
- Gained knowledge on the sports nutrition and scheduling the appropriate food meal plan for good physical fitness.

Theory

Overview of nutritional management vis-a-vis physical fitness, techniques and methods of measuring physical fitness. Body composition -methods of measuring body composition - direct and indirect, Body composition in different physiological conditions and factors affecting it. Energy metabolism and physical fitness- aerobic and anaerobic, concept, importance, influencing factors. Techniques to measure energy expenditure and energy intake, Aging physiology, mechanism and role of nutrients in arresting aging process, aging theories, nutritional requirements of sports personnel involved in various sports, Basic exercise physiology and biochemistry -Physiological and metabolic changes during and after sports activity. Macronutrients metabolism in exercise – carbohydrates problems and fat (Fueling before, during and after exercise). Effects of dehydration and rehydration in exercise and role of water and electrolytes in performance. Vitamins metabolism in sports. Free radicals in exercise role of antioxidants in exercise. Minerals and trace minerals metabolism in exercise and essential minerals and trace minerals in

sports. Sports nutrition products, sports nutrition, theory to practice –Special consideration in sports nutrition- Women, young, diabetic, vegetarian athletes, Sport specific nutrition –Gymnastics, weight lifters, skiers, cyclists, swimming, skating, Winning recipes for peak performance.

Practical

Development of project proposal on nutrition in physical fitness. Development of methodology for collection of data, assessment of nutritional status and physical fitness, practice of using anthropometry, clinical and dietary assessment techniques, assessment of body composition of the selected group. Development and standardization of tool for physical fitness. Assessment of physical fitness of the selected group using standard tool. Use and practice of ergonomic equipment for a assessment of energy expenditure for different activities. Compilation of data of anthropometry and clinical observation. Analysis of dietary intake to assess the nutrient intake, interpretation of nutrient intake in comparison with RDA, compilation of data on energy expenditure, analysis of data and Final report writing of the project and presentation.

Suggested Reading:

- Falkner, F. and Tanner JM. (1978). Human growth - Principles and prenatal growth. Vol. I.
- Falkner, F. and Tarnner JM. (1980). Human growth methodology. Ecological, genetic, and nutritional effects on growth. Vol. III. Plenum Press.
- Passmore, R. and Eastwood MA. (1986). Human nutrition and dietetics. ELBS Churchill Livngstone.
- Pike, R.L. and Brown M.L. (1988). Nutrition - An Integrated Approach. John Wiley and Sons.

NEM 105 Nutrition in Emergencies 2 (2+0)

Course objectives: To provide insights on the pre-cautionary food during health emergencies of various types.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained knowledge on the nutritional deficiencies resulting in health deterioration.
- Able to plan the nutritional requirement to overcome the health emergencies.
- Ability to suggest precautionary hygiene maintenance methods during communicable diseases during health emergency.

Theory

Definition and historical perspective of national emergencies Starvation in emergencies arising out of drought, floods, earthquakes, locust attack, war wrong policies and properties. Effect of short, medium and long term emergencies on food and nutrients, intake, Major nutritional deficiency diseases in emergencies. Food needs at national level during normal emergencies, precautions against food shortage. Mobilization of local resources; general fund distribution, mass and supplementary feeding, therapeutic feeding, social funds. Control of communicable diseases, public health and hygiene problems during Emergencies.

Suggested Readings:

- Messer E, Mark J, Cohen C and Jashinta D. 1998. Food from Peace: Breaking the Links between Conflicts and Hunger. IFPRI, Washington.
- Spark A. 2007. Nutrition in Public Health: Principles, Policies and Practice. CRC Press.
- WHO, 2000 The Management of Nutrition in Major Emergencies.

NED 105 Nutrition Education 3 (1+2)

Course objectives: To comprehensively provide knowledge on the community level public health and nutritional food standards for a target groups.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained ability to educate the target community on food and nutrition.
- Ability to generate audio-visual aids to educate the community on public health.
- Gained ability to conduct nutritional deficiency survey, analyze the data and reporting with suitable recommendations.

Theory

Objectives, principles and importance of nutrition education in a community. Goals and history of public health nutrition. Identification of nutritional problems and target groups. Nutritional surveys, National Nutrition Monitoring Bureau. Deficiency diseases and public health problems-Vit. A, iron and iodine deficiencies, other micronutrient deficiencies. Communication techniques: Process, its components. Communication techniques: Mass, group and individual; advantages and disadvantages. Theory and practice of audio-visual teaching. Learning by doing, learning by observation, symbolic experience. Classification and use of audio visual aid- Electronic aid, non-projected and three dimensional. Selection and evaluation of audio visual aids. Nutrition education: Planning effective programs for target groups, developing appropriate messages.

Practical

Preparation and use of instructional material- Charts, posters, calendars, flipcharts, pamphlets. Practicing use of nutrition education material on vulnerable groups in the community, rural and urban. Evaluation of nutrition education programs executed. Assessment of nutritional status: Techniques employed for-height, weight, body mass index, skin fold measurements. Inferences to identify nutritional problems.

Suggested Readings

- Obert, J.C. (1986). Community nutrition. Macmillan Publishing Co., N.Y.
Reddy, A.A. (2001). Extension education. Sree Lakshmi Press, Bapatla.
Ray, G.L. (1991). Extension communication and management. Naya Prokash, Kolkata.
Rathore, O.S.; Chauhan, M.S; Dhakar, S.D. and Ojha, S.N. (2001). Handbook of extension education. Agrotech Publishing Academy, Udaipur.
Dale, E. Audio-visual methods in teaching. The Dryden Press. Latest edition.

NUG 105 Nutrigenomics 3 (3+0)

Course objectives: To provide critical insights on GMOs in food industry and technological innovations.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained basic knowledge on the tools and technologies used in genetic modification of food items and food grade microorganisms.
- Ability to comprehensively explain the processes involved in development of food items utilizing the genomic approaches.

Theory

Genomics – scope and importance, Definition, global impact of genomics; genomics in health care, agriculture and environment; processes and products of biotechnology; application of genomics in development of nutritious foods. Genes – nature, concept and synthesis; chemical nature of DNA, nucleotides and nucleosides; structure of RNA – RNA splicing; units of gene – gene expression, regulation and transcription; genetic engineering for human health; production of human peptide hormone genes; Single cell protein; Role of genomics in enzymology and product development, fermentation process, fruit juice extraction, genetic improvement of food grade microorganisms; Nutritional significance of food products developed by biotechnological techniques; Scientific, technological and resource constraints on genomics; important factors affecting development in nutria genomics.

Suggested Readings:

- Nestle M. 2003. Safe Food: Bacteria, Biotechnology and Bioterrorism. University of California Press.
- Rogers PL and Fleet GH. 1989. Biotechnology and Food Industry. Univ. of Minnesota.

TFN 105 Traditional Food and Nutrition 2 (1+1)

Objective: To provide exposure to various traditional foods, healthy food habits and nutrition value relating to health.

Course outcome: Upon completion of the course students will be able to;

- Appreciate various traditional foods and their health benefits.
- Explain the nutritional value of various types of foods- traditional and contemporary foods.
- Identify important ingredients and health value
- Acquired skills to design and implement the regenerative agricultural practices
- Explain and appreciate the long-term benefits of regenerative agriculture and its resilience to climate change scenarios.

Theory

Indigenous people and sustainable diets, Informed local knowledge on food and concepts of living well, Food culture anthropology and community history and cultural impact on food, Food habits and biodiversity and natural resources, global heritage of food knowledge and human well-being.

Traditional food system- plant, insects and animal sourced, Traditional food types, Practice of vegetarianism and non-vegetarianism, Dietary value of food types, Fruit and plant based liquid foods and nutritional value and health benefits, Food types with health benefits, Foods with ability to cure specific diseases, Culture, festivals and foods habits, Region specific food habits, Climate and food habits, Forest based food ingredients, Seasonality and popularity with children and women, Little-used or currently unused traditional food known by elders,

Preparation of traditional food, cooking methods, utensils-metals and earthen and its significance, storage and spoilage, taste and quality variants, natural food preservatives and coloring agents.

Qualitative parameters of traditional, conventional, contemporary and modern food habits and health, Villages, Cities and Lifestyle in demography's. Processed and ready to eat traditional foods,

Ethical values related to food industry. Development of business model through value addition to traditional foods.

Practical

Collect data on food types, including seasonality, preparations, suitability for children, nutrition value etc.

Collect the scientific parameters of traditional food, including taxonomic identifications, laboratory evaluation and compilation of nutrient composition.

Understand dietary food use and nutrient intake patterns and cultural context in the community of indigenous people, particularly for infants, children, mothers and elders.

Develop plan for food-based intervention to improve community micronutrient status within the environmental and cultural context of the community, and document success.

National food and nutrition standards and micronutrient nutrition situation reports on traditional and contemporary foods.

Develop participatory approaches with communities of indigenous peoples to conserve the traditional food.

Visit to village to learn about the traditional foods.

Visit to commercial food processing industry.

Suggested reading

Fox, B. F. and Cameron, A. G. 1970. Food Science - a Chemical Approach. University Press, London

Swaminathan, M. 1988. Handbook of Food Science and Experimental Foods BAPPCO, Bangalore

Shakuntala Manay N, Shadaksharaswamy M 1998. Foods, Facts and Principles, New Age International Publishers, New Delhi

Kalia, M. and Sood, S. 2010. Food Preservation and Processing. Revised Edition, Kalyani Publishers, New Delhi

Semester VI

THP 106 Therapeutic Nutrition - II 3 (2+1)

Course objectives: To provide insights on therapeutic dietetics.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained knowledge on the health disorders and their symptoms.
- Gained knowledge on the functioning of dietician, creation of counseling centre and ethical codes.

Theory

Principles and objectives of therapeutic diets. Cardiovascular diseases- Causes, symptoms and dietary management in atherosclerosis and hypertension, myocardial infarction, cerebrovascular stroke, congestive heart failure. Diabetes mellitus and gout- Types, causes, symptoms and dietary management. Renal disorders – Physiology of kidney; causes, symptoms and dietary management in nephrosis, nephritis, acute and chronic renal failure, renal calculi; dialysis. Respiratory disorders – Acute and chronic COPD, acute respiratory disorders. Cancer- Causes, symptoms and dietary management. Dietitian – Definition, role and responsibilities of a dietitian, code of ethics, competencies of dietitian. Management of dietetics department, guidelines and requirements for establishing a diet counseling centre, techniques for diet counseling, stages of change in behavior.

Practical

Planning and preparation of diets for patients suffering from atherosclerosis, hypertension, myocardial infarction, cerebrovascular stroke, congestive heart failure, different types of diabetes mellitus, gout. Diet planning and preparation for various eating disorders i.e. anorexia nervosa, bulimia, underweight, overweight and obesity. Planning and preparation of diets for renal disorders i.e. nephrosis, nephritis, acute and chronic renal failure, renal calculi and respiratory disorders – Acute and chronic COPD, acute respiratory disorders. Setting up a unit for nutrition counseling. Role play exercises for counseling.

Suggested Readings:

- Antia,P. (1986). Clinical dietetics and nutrition. Oxford univ. Bombay.
Moris,E.S. (1994). Modern nutrition in health and disease. Leaned febiger, USA.
Srilakshmi, B. (1995). Dietetics. New age international publishers, New Delhi.
Corinne H. Robinson, Marilyn R. Lawler, Wanda L. Chenoweth, Ann E. Garwick.
(1982). Normal and Therapeutic Nutrition. (pp- 1-16). New York, Macmillan
Publishing Company.

FPP 106 Food Processing and Packaging 4 (3+1)

Course objectives: To be well versed with the techniques and skills of food processing and packaging practices.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know about the physico-chemical characteristics, nutritional quality and shelf life studies.
- Know various laws related to packaging.
- Know about the shelf life of packed food.

Theory

Food processing and preservation techniques for cereals, milk, fruits and vegetables, oil seeds, meat, fish and poultry and their impact on physical and chemical characteristics. Physico chemical characteristics, nutritional quality and shelf life studies. Factors effecting quality of processed foods. Food packaging, package functions, requirement and packaging materials. Principles in the development of protective packaging. Laws related to packaging. Shelf-life of packed food, special problems in packaging of foodstuffs.

Practical

Market survey for packaged processed food stuffs. Cereal cookery. Preparations showing dextrinization and gelatinization, gluten formation and influence factors. Vegetable cookery: effect of heat and alkali on pigment, preparation of soups, salads and beverages. Use of milk and milk products and egg in various preparations Estimation of shelf- life of packaged food stuffs.

Suggested Readings:

- Potter,N.N. (1996). Food science. The AVIPublishing Company, Inc., Westport, Connecticut.
Kalia, M. and Sood, S. (2010). Food preservation and processing. Revised edition,
Kalyani Publishers, New Delhi.

Srilakshmi, B. (2010). Food science (Fifth ed.) New Age International Pvt. Limited, Pub., New Delhi.
Frank, A., and Paine, H.Y. (2003). A Handbook of food packaging. Springer science and business Media, U.K.
Gordon L. and Robertson. Food packaging-principles and applications, Marcel Dekka Inc, Newyork

POU 106 Pulses and Oilseeds: Preparation and Utilization 3 (2+1)

Course objectives: To comprehensively provide knowledge on the nutritional value and processing food items involving pulses and oilseeds.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained on major pulses and oil seed crops and their nutritional value.
- Gained knowledge on processing and storage practices without affecting the quality.
- Ability to identify suitable processing methods develop secondary products
- Gained knowledge on value addition to the byproducts of pulses and oilseed crops after processing.

Theory

Food uses of major pulses- Bengal gram, green gram, black gram, red gram, lentils etc. Primary processing of pulses- Cleaning, drying, storage, control of storage pests. Secondary processing methods- Dehulling, small scale processing, large scale processing. Traditional *dal* mills and modern *dal* mills, nutrient losses during processing. Processing methods of pulses like soaking, germination, cooking, fermentation etc. Major oilseeds produced in India and their utility- groundnut, rapeseed/mustard, soybean, sesame seed, sunflower, safflower, cottonseed, linseed, castor. Pre-treatments and oil extraction from different oilseeds. Refining, bleaching, deodorization, hydrogenation processes of edible oils Anti-nutritional factors and toxic constituents of pulses and oilseeds. Technology of production of oilseed meals/flours, protein concentrates and isolates of pulses and oilseeds and their utilization. By product utilization of pulses and oilseeds.

Practical

Visit to traditional *dal* mills, modern *dal* mills, oil mills to expose students to *dal* milling operations and oil extraction operations. Demonstrations on soaking, dehulling, germination, fermentation methods Analysis of antinutrients- Phytic acid, saponins, trypsin inhibitors etc. Preparation of snacks based on pulses and oilseeds. Preparation of recipes based on germinated and fermented pulses.

Suggested Readings:

Khader, V. Text Book of Food science and technology. Directorate of information and publications of agriculture, ICAR, Krishi Anusandhan Bhawan, Pusa, New Delhi
Srilakshmi B. (2010). Food science. New Age International Pvt. Ltd. New Delhi
Salunkhe, D. and Deshpande, S.S. foods of plant origin: Production, technology and human nutrition. The AVI Publishings Inc. New York
Kalia, M and Sood S. (2010), Food preservation and processing. Kalyani Publishers, Ludhiana
Potty, V.H. and Mulky, M.J. Food processing. Oxford and IBH.

NHF 106 Nutraceuticals and Health Foods 3 (3+0)

Course objectives: To provide comprehensive knowledge on the nutraceuticals as food and medicine.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained knowledge on various types of nutraceuticals and their benefits to health.
- Ability to classify various of nutraceuticals with medicinal value and functional foods.
- Gained knowledge on use nutraceuticals to cure specific diseases
- Gained knowledge on regulatory and legal guidelines of functional foods.

Theory

Introduction, relationship between nutraceuticals, foods and medicines. Definition of nutraceuticals and functional foods, synonymous terms i.e. bioactive compound, phytochemicals, classification of nutraceutical substances based on food sources and based on mechanism of action, labeling and health claims. Regulatory issues for nutraceuticals including national and international standards. Functional foods. Definition, classification and importance. Need for Nutraceuticals Nutraceuticals: Global Markets and trends. Potential health benefits of major nutraceuticals, omega-3, lycopene, isoflavonoids, prebiotics and probiotics, glucosamine, phytosterols etc, metabolism, bioavailability and pharmacokinetics of nutraceuticals. Concept of angiogenesis, nutraceuticals for joint health, cardiovascular diseases, cancer, diabetes, obesity, eye health, cholesterol management. mental health. Safety, adverse effects and interactions of nutraceuticals and functions of foods. Processing technologies. Therapeutic use of nutraceuticals and functional foods Safety aspects of functional foods. Analytical techniques. Quality of nutraceuticals. Nutraceutical Stability. Concerns and shelf life testing. Regulatory aspects of functional foods. Legal aspects of functional foods. Current research in functional foods.

Suggested Readings:

- Robert EC. (2006). Handbook of nutraceuticals and functional foods. 2nd edn. Wildman.
Shi J. (Ed.). (2006). Functional food. ingredients and nutraceuticals: Processing Technologies. CRC Press.
Webb GP. (2006). Dietary supplements and functional foods. Blackwell Publ.
Robert. E.C (2002). Hand book of neutraceuticals and functional foods, CRC, Press
Goldber. I. (1999). Functional foods: Designer foods, Pharma foods and Nutraceuticals, An Aspen Publications.

MMP 106 Meat and Meat Products: Preparation and Utilization 3 (2+1)

Course objectives: To provide insights on food grade meat industry and food safety.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained overall knowledge on meat industry and functioning.
- Gained knowledge various methods of processing of meat, preservation and quality control standards.

- Ability to understand the standards and quality control measures adopted for meat and meat products in India and abroad.

Theory

Development of meat industry. Meat byproduct utilization. Pre-slaughter operations of meat animals and poultry birds. Structure, composition, nutritive value, postmortem changes and eating quality of meat tissues. Principles of various preservation techniques like chilling, freezing, curing, smoking, thermal processing, canning and irradiation. Meat cutting and packaging. Microbial and other deteriorative changes in meat and their identification. Standards and quality control measures adopted for meat and meat products in India and abroad. Principles of preparation of different meat products. Meat food products order, meat regulations under FSSAI, eating quality of meat, sensory evaluation of meat food products. Fraudulent substitution of meat and its recognition. Organic meat, value added meat products.

Suggested Readings:

- Forrest, J. C., Aberle E. D. , Harlod B. H. , Max D. J. , Robert A. M. (1975). Principles of meat science, W.H. Freeman and Company, San Francisco.
- Sharma B.D. (2005). meat and meat production technology (including poultry production technology). Jaypee Brothers Medical Publishers (P) Ltd. New Delhi.

BCF 106 Bakery and Confectionary4 (2+2)

Course objectives: To provide comprehensive knowledge on the production process of bakery products and quality control.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained insights in baking science to produce various products with variable nutritional values.
- Ability to analyze the ingredients, their proportion, quality control and their function in the process of producing bakery products and confectionaries.
- Gained knowledge on various categories of bakery products, their classification and
- their shelf-life

Theory

Introduction to baking science. Basic materials used in bakery and confectionery, selection, properties and functions. Flours- constituents, functions and characteristics of good flour and tests. Different types of flour mixtures used bakery and confectionery, egg structure, composition and its functions in bakery and confectionery. Different types of fats and oils used in bakery and confectionery and their functions. Sugars and functions and types of sugars used in bakery and confectionery, cooking of sugar and its stages, leavening agents used in bakery and confectionery and their functions, liquids and moisturizing agents used in bakery and confectionery and their functions. Salt and its functions in bakery and confectionery and their functions, yeast and types of yeast used in bakery and confectionery and their functions. Improvers and emulsifiers used in bakery and confectionery and their functions. Biscuits and cookies- basic ingredients required and their functions, techniques in preparation of biscuits and cookies and different types of biscuits and cookies, faults and remedies in biscuit and cookies preparation, Color, flavoring and related products used in bakery and confectionery. Cakes- Types of cakes, ingredients required and their role in cake preparation. Balancing a cake formula, characteristics of good cake -external

and internal characteristics, faults and remedies in cakes preparation, gelling, whipping agents and related products used bakery and confectionery, bread – Ingredients required in bread preparation and their functions, steps involved in preparation of bread, different methods of bread preparation. Characteristics of good bread -External and internal characteristics bread diseases and preventive measures- Faults and remedies in bread preparation, Icing – Types of icing and ingredients used in icing and their role gums, jellies-introduction, technology and chemistry of the hydrocolloids, processing treatments, tools and techniques used in bakery, equipment used in bakery, caramel, toffee and fondant-introduction, ingredients, structure of toffee, formulations, texture of toffee and fudge, quality control of bakery products.

Practical

Use of different bakery equipment, balancing the formula for bakery products, demonstration on standard method of making different types of biscuits, salt, coconut and fruit biscuits, biscuits, Demonstration on standard method of making different types of cookies, preparation of different types of cookies, plain sponge cake, chocolate cake, pineapple upside down cake, walnut cake, madiera cake, fruit/ plum cake, carrot cake, Demonstration on standard method of making of pastries, pastries, icings and cake decoration.

Suggested Readings:

Edmund, B. B. and James, steward. Cake Making, G.S.T. Bamford, Leonard Hill Book, London
Peter R. W. Biscuit manufacture- Fundamentals of Online Production. Elsevier Publishers
Fance, W.J and Wragg, B.H. Up-to- date bread making, Maclaren and Sons, London.

FTL 106 Food Toxicology 2 (2+0)

Course objectives: To create an awareness among the young generation about various carcinogenic products and toxic substances in food and their prevention.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Know about various types of food poisoning.
- Know about Various chemical toxins and their residual values in foods.
- Know about various preventive measures.

Theory

Introduction and significance of food toxicology. Food poisoning –Types, causative factors, signs and symptoms, preventive measures. Natural food toxins – Anti-nutritional factors, other food toxins, their harmful effects and methods of removal. Microbial toxins and food intoxication, Source of contamination, effect on health, preventive measures, methods of inactivation/destruction. Chemical toxins – Pesticides, insecticides, metallic and others, residual effects, preventive measures, methods of removal. Food packaging material – Potential contaminants from food packaging material.

Suggested Reading:

Kramer and Kramer (1984) Nutritional toxicology Vol I and II.
Fennamma, O.R (1996) Food chemistry.

Semester VII

IPT 701 In-plant Training 20 (0+20)

Course objectives: To provide pragmatic knowledge through visit to institutions involved in food nutrition and quality testing laboratories

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained the practical knowledge on the institution functions, process in production of food products, quality control and storage of food grade products.
- Ability classify various food processing industries.
- Gained knowledge various health issues related to food and classification of diseases by examining the patients in the hospitals.

Semester VIII

IPT-FVU 801 Fruits and Vegetables: Preparation and Utilization - II 2(0+2)

Course objectives: To provide hands-on experience on grading and quality control of fruits and vegetables and their storage conditions.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained methods of grading of fruits and vegetables used in quality control.
- Gained knowledge on processing, quality control and packing by a visit to food processing industry.
- Ability to develop quality control report identifying the grades.

Practical

Grading, selection and preparation of fruits and vegetables for preservation Preparation of various fruits, vegetables and related products Canning and hot packing of fruit and vegetable products Visit to fruit and vegetable processing industries.

Suggested readings:

Kalia, M. and Sood, S. (2010). Food preservation and processing. Revised edition, Kalyani Publishers, New Delhi.
Sivasankar, B. (2002). Food processing and preservation. PHI Learning Pvt. Ltd.
Singh, I. S. (2009). Post harvest handling and processing of fruits and vegetables. Westville Publishing House, New Delhi.

IPT-NAM 802 Nutritional Status Assessment Methods 3 (0+3)

Course objectives: To provide comprehensive knowledge on data generation using surveys and generate a technical report.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Ability to develop a suitable survey questionnaire to collect precise data to satisfy the objective.
- Gained knowledge to collate the data, analyze the data and write the technical

report with interpretations and recommendations.

Practical

Assessment of nutritional status of community using dietary surveys, clinical, surveys, anthropometric Measurements-Data collection, tabulation, interpretation and report writing. Target group selection from local hospitals suffering from nutritional deficiencies, tabulation, interpretation and report writing of their tested biomarkers.

Suggested Readings:

- Sehgal S. and Raghuvanshi RS. (2007). Textbook of community nutrition Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi.
- Latham. M.C. (1997). Human nutrition in the developing world. Food and Agricultural Organization of United Nations.
- Srilakshmi, B. (2012). Nutrition science, New age international pvt. Ltd. Publishers. New Delhi.
- Srilakshmi, B. (2012). Dietetics, New age international pvt. Ltd. Publishers. New Delhi.
- Dahiya, S., Boora, P. and Rani, V. (2013). A manual on Community Nutrition, Department of Foods and Nutrition, published under ICAR Assistance scheme.
- Bamji, S.M., Rao, N.P. and Reddy, V. (1996). Textbook of human nutrition. Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
- Swaminathan, M. (1985). Essential of food and nutrition. 2nd edition, Vol. II. The Bangalore printing and publishing company Ltd. Bangalore.

IPT-FSM 803 Food Service Management – II 3 (0+3)

Course objectives: To provide comprehensive knowledge on the development of food canteen, development of food recipes and their quality control with an approval project.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Ability to categorize various recipes and standardization of recipes with quality control methods.
- Gained knowledge on organizing and planning menu for food eateries and costing and retailing of food items.
- Ability to organize the project proposal and logistics required to develop a canteen and/or a catering enterprise.
- Gained knowledge on reporting of food control and pricing of food enterprise set-up.

Practical

Introduction to quantity food production, familiarization to equipment for quantity food production, standardization of recipes – procedure. Practical exercise on standardization of recipe, multiplication of standard recipe, portioning and cost calculation. Standardization of recipes suitable for different catering services i.e. cafeterias /canteens, snack bars, industrial canteens, residential hostels. Costing of recipes planned and fixing the price. Exercise on quantity food production for different type of food service establishments. Visit to residential hostel, hospital canteen, industrial canteen, star hotel and fast food centre to observe the organization, management and administration. Making a detailed project report for establishing a food service unit including making purchase documents for equipment purchase and tenders

etc. Organizing and planning menu for college canteen as a catering enterprise, setting up of a canteen, management of college canteen - procurement of materials. Practical exercise on food preparation, pricing and sale. Preparation and presentation of report on management of canteen.

Suggested reading:

Fuller J. 1966. Chefs Manual and a Kitchen Management. B.T. Badtsford Ltd.
Sethi M & Malhan S. 1997. Catering Management - An Integral Approach. New Age International.
Treat N & Richards 1997. Quantity Cookery. Little Brown & Co.
West BB, Wood L, Harger VF & Shugart GS. 1977. Food Service in Institutions, John Wiley & Sons.

IPT-DNC 804 Diet and Nutrition Counseling 2 (0+2)

Course objectives: To provide insights on dietary counselling approaches and educative materials keeping the standards and regulatory guidelines.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained knowledge on health clinics, dietician counsel centres,
- Gained comprehensive ability to collect data on history of patient.
- Ability to prepare the educative handouts on diseases in relation to food and nutritional value.

Practical

Self-assessment of role as a dietitian – Pre-test on role, summary of competencies, preparation of self-confidence checklist and post-test on self-role. Preparation of SOAP notes based on case studies and group discussion. Preparation of overweight and underweight fact list handout and development of counseling guidelines for weight loss and weight gain. Weight loss counseling – Use of role play technique, workshop for patients at obesity clinic. Visit to hospitals with therapeutic kitchen setup. Diabetic diet counseling at diet and nutrition counseling centre, diabetic clinics, diabetic diet exhibition in collaboration with hospitals for the benefit of public, development of dietary fat facts list, cholesterol facts list, sodium facts list, Development of dietary counseling tips for different cardiovascular disorder and counseling; cardiac patients using role play technique, presentation in specialty hospital (CVD for patients as well as attendants). Diet exhibition on cardiovascular disorders in a specialty hospital / general hospital, preparation of handouts on ulcer facts list, high fibre facts list, low residue facts list, low lactose facts list, counseling for patients suffering from diarrhoea, constipation, colitis, diverticulosis and ulcer. Preparation of SOAP notes and gall bladder facts list handout and counseling a patient of gall stones. Preparation of liver disease facts list handout, collection of case history of patient suffering from hepatitis, cirrhosis of liver, alcoholics. Counseling the patient and conducting group discussion. Preparation of kidney disease facts list handout and development of counseling tips for kidney disorders, dietary counseling in a specialty hospital / diet and nutrition counseling centre for kidney disorder and diet exhibition for kidney disorder. Preparation of cancer facts list handout, Preparation of list of parenteral and enteral products available in the market for use during counseling. Setting up a unit for nutrition counseling. Role play exercises for counseling. Supervised counseling of patients/clients.

Suggested readings:

Antia, P. (1986). Clinical dietetics and nutrition. Oxford univ. Bombay.
Moris, E.S. (1994). Modern nutrition in health and disease. Leaned febiger, USA.

Srilakshmi, B. (1995). Dietetics. New age international publishers, New Delhi.
Corinne H. Robinson, Marilyn R. Lawler, Wanda L. Chenoweth, Ann E. Garwick.
(1982). Normal and Therapeutic Nutrition. (pp- 1-16). New York, Macmillan
Publishing Company.

IPT-SEM 805 Seminar 1 (0+1)

Course objectives: To provide an opportunity to deliver a analytical lecture on a specific topic before a forum.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained ability to organize and collate data and resources for making an academic presentation.
- Acquired skills to make an academic presentation before academic experts.

IPT-SPP 806 Special Project 5 (0+5)

Course objectives: To provide a comprehensive knowledge on development of a technical document on a specific topic.

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained the knowledge and comprehensive ability on literature survey on specific topic.
- Acquired skills to organize the document with various heads, technical information, presentation of data in table and/or figure format.

Practical

Preparation of an assignment and accessing information. The student will submit a 3,500 words assignment. The assignment will consist of a product description under the headings. Food formulation, manufacturing process, quality control, nutritional value, packaging, distribution and marketing, financial management, Floor planning and layout. Where the student's employer is not involved in the manufacture of a product an alternative topic relevant to the company can be agreed with the program manager. The topic to be covered will be decided by the student in association with their employer and should include the development of a new product or the evaluation of a new process or the study of a particular problem or a literature review. The student will be required to give a short presentation on their assignment to the class and lecturer.

IPT-EBM 807 Entrepreneurship Development and Business Management 4 (0+4)

Course objectives: To develop skills to develop business model and entrepreneurship abilities

Teaching-Learning Outcomes: Upon completion of the course students will be able to;

- Gained analytical skills to understand the current status of the food industry, institutional functioning and market mechanisms etc.
- Acquired knowledge build business model with financial balance sheets, marketing methods.
- Gained knowledge on product promotion avenues etc.

Practical

Practical exercise on entrepreneurship motivation training– Micro lab Interface with successful food entrepreneurs. Market survey for identification of products and product selection, cost estimation. Project formulation, group discussion and report writing. Visit to a government agency for appraisal on policies. Visit to non-governmental institutions promoting entrepreneurship. Critical analysis of financial institutions government and non- government, preparation of financial statements and group discussion. Financial analysis of projects prepared, planning, implementation of the project. Learning product promotion techniques, developing brand name and label and group discussion. Appraisal of packaging materials and techniques, analysis of advertisements. Visit to successful enterprises. Performance review of the unit– Profitability and report.

Suggested readings:

Balasubramanian, A. (1998), Personal management, everest Publishing House, Pune
Kotler, P. (1997) Marketing management 9th edn. Prentice-Hall of India, New Delhi
Sivakamasundari, S. (1995) Entrepreneurship development for rural women- Vol-I,
Asian and Pacific Centre for Transfer of Technology, New Delhi