

# Vidyasagar University

## Curriculum for B.Sc. (Honours) in Nutrition [Choice Based Credit System]

### Semester-V

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC- 11		C11T: Public Health and Hygiene	Core Course -11	4	0	0	6	75
		- Lab		0	0	4		
CC- 12		C12T: Research Methodology	Core Course -12	4	0	0	6	75
		- Lab		0	0	4		
DSE-1		TBD	Discipline Specific Elective - 1	5/4	1/0	0/4	6	75
DSE-2		TBD	Discipline Specific Elective -2	5/4	1/0	0/4	6	75
<b>Semester Total</b>							<b>24</b>	<b>300</b>

**L= Lecture, T= Tutorial, P = Practical, CC - Core Course, TBD - To be decided, DSE: Discipline Specific Elective.**

## **Semester-V**

### **List of Core Course (CC)**

**CC-11: Public Health and Hygiene**

**CC-12: Research Methodology**

### **Discipline Specific Electives (DSE)**

**DSE-1: Chemical Safety of Foods**

**Or**

**DSE-1: Microbiological safety of foods**

**Or**

**DSE-1: Food Sanitation and Hygiene**

**DSE-2: Quality Assurance in Food Sectors**

**Or**

**DSE-2: Quality Control and Food Standards**

**Or**

**DSE-2: Food Quality and Sensory Evaluation**

## Semester-V

### Core Courses (CC)

**CC- 11: Public Health and Hygiene**

**Credits 06**

**CC11T: Public Health and Hygiene**

**Credits 04**

#### **Course Contents:**

1. **Food adulteration:** common, adulterants, and health hazards. Food standards and food laws. National and International; PFA, FSSAI, HACCP, ISO Certification; Consumer guidance society, Consumer rights, Consumer court, Central facilities for assessing food adulteration, Role of food inspectors.
2. **Community Water and Waste Management:** Importance of water to the community, etiology and effects of toxic agents, water borne infectious agents, sources of water, safe drinking water/portability and tests for portability, community, waste and waste disposal, sewage disposal and treatment, solid waste and disposal, liquid waste disposal.
3. **Food Borne Disorders:** Food borne infections- Typhoid, Para typhoid, cholera, infective hepatitis, amoebiasis - Food borne intoxications- Disorders caused by; Natural toxins, chemical toxins and Microbiological toxins in food- Lathyrism, staphylococcal intoxication, Botulism, clostridium perfringens, Mycotoxins.
4. **Food handling and Public Health:** Preventing food borne illness and the spread of communicable disease; Sanitation of food serving institution; environmental sanitation, hygienic in food handling and personal hygiene of food handler.
5. **Air & health-** Indices of thermal comfort , Pollution a) Sources b) Pollutants c) Monitoring d) Effects e) Prevention & control.
6. **Mental health-** Health & diseases, Concept of a) Normality b) Mental health, Magnitude of the problem, Prevention of mental diseases, Alcohol related & drug related problems, mental health services in India.
7. **Health care delivery system:** Patterns of health care delivery, History of development of health care delivery system in India, Reports of different committees, Three-tier health care delivery system, Primary health center, Subcentre, CHV, Urban health infrastructure.
8. **Demography & Population Control:** Introduction, Definition, Demographic cycle, Population Pyramid, Fertility, Factors affecting fertility, Indicators of fertility, Population

explosion as a public health problem, Approaches for population control, Family planning methods.

**C11P: Public Health and Hygiene ( Lab)**

**Credits 02**

**List of Practical**

Assignment programme on public health, nutrition and disease – covering any one of the following fields

1. Protein under nutrition and its recovery.
2. Vitamin or Mineral under nutrition and its recovery.
3. Dietary management of non-communicable disease.
4. Dietary management of growing child.
5. Impact of nutrition education on awareness development in the field of personal health.

**CC-12: Research Methodology**

**Credits 06**

**C12T: Research Methodology**

**Credits 04**

**Course Contents:**

1. Introduction to Research Methodology: Meaning of Research, Objectives of Research, Motivations in Research, Criteria of Good Research, Types of Research– Fundamental research, Applied Research, Action research, Qualitative Research, Quantitative Research, Historical research.
2. Defining the Research Problem : Scientific Problem, Formation of scientific Problem, criteria of good research problem
3. The Review of Literature: Meaning of Review of Literature, Need and importances of Review of Literature, Objectives of Review of Literature
4. The Research Hypotheses: Definitions of Hypothesis, Functions of Hypothesis, types of Hypothesis, Characteristics of a Good Hypothesis
5. Sampling – Criteria, Design, Characteristics of good sampling, types of sampling method.
6. Methods of Data Collection: Primary and secondary data, Criteria of good data, Observation Method, Interview method, questionnaire and Schedules, Case Study Method.
7. Experimental design – single and multi group experimental design, Quasi experimental Design
9. Ethical issues in research: Code of Ethics in Research – Ethics and Research Process – Importance of Ethics in Research

## C12P: Research Methodology (Lab)

Credits 02

### Practical

A Project work on public health / nutritional biochemistry / nutritional survey to be submitted.

Formulation of the Project:

1. Meaning of scientific research and its methods. Formulation of project design.
2. Types of project design- exploratory, descriptive, experimental, cross sectional or longitudinal.
3. Methods: survey, case study, anthropological or experimental
4. Tools and techniques: observation, interviewing, questionnaire schedules or rating scales
5. Tabulation and interpretation: Tabular and graphic representation of data and its interpretation, bar diagram, pie diagram. Statistical procedures - variables, mean, standard deviation, test of hypothesis (t-test), chi-square test, degrees of freedom, null hypothesis, z-score.

### Discipline Specific Electives (DSE)

**DSE-1: Chemical Safety of Foods**

**Credits 06**

**DSE1T: Chemical Safety of Foods**

**Credits 06**

### Course Contents:

Pesticides and veterinary drugs: Detection and quantification of carbamates, organochlorine and organosulphur, organohalogens, nitrites, herbicides, hormones, antibiotics, steroids, environmental chemicals - heavy metals, toxic residues, radioactive isotopes.

Processing contaminants: Detection, quantification and health hazards of direct contaminants – acrylamide, PAHs, oxyhalides, and haloacetic acids, preservatives, flavor enhancers, color additives. Indirect contaminants- boiler water additives, peeling aids, defoaming agents, building and equipment contaminates: lubricants, paint and coatings, contaminants during packaging, storage and transport: cleaners, sanitizers and cross contaminants.

Food additives: Detection, quantification and health hazards of hydrogenated or partially hydrogenated oils, high-fructose corn syrup, artificial colorants, artificial sweeteners such as aspartame, sucralose and saccharin, BHA or BHT, monosodium glutamate, hydrolyzed vegetable protein or autolyzed yeast extract, potassium bromate, propyl gallate, sulfites, sodium nitrate, sodium benzoate.

Food colorants and sweeteners: Detection, quantification and health hazards of brilliant

blue, Indigo, carmine, citrus red , fast green, erythrosine, allura red ,tartrazine, sunset yellow,lake pigments and non-certified colorants, food sweeteners- neotame, sorbitol and non certified sweeteners.

Emulsifiers, stabilizers, thickening and gelling agents: tara gum, soyabean hemicelucose, sucroglycerides, stearyl tartarate, talc, gluconic acid, candelilla wax, carbamide, argon, salt of aspartame and other non certified agents- detection, quantification and health hazards.

### **Suggested Readings:**

1. Branen, A.L., Davidson, P.M. & Salminen, S. (2007) Food Additives, 2<sup>nd</sup> Ed., Marcel Dekker.
2. George, A.B. (2006) Encyclopedia of Food and Color Additives, Vol. III, CRC Press, LLC. Boca Raton, FL
3. George, A.B. (2008) Fenaroli's Handbook of Flavor Ingredients, 5<sup>th</sup> Ed, CRC Press, LLC. Boca Raton, FL
4. Madhavi, D.L., Deshpande, S.S., & Salunkhe, D.K. (2006) Food Antioxidants: Technological, Toxicological and Health Perspective, MarcelDekker
5. Morton, I.D., & MacLeod, A.J. (2008) Food Flavors, Part A, B & C. Elsevier.
6. Nakai, S., & Modler, H.W. (2007) Food Proteins. Processing Applications. Wiley VCH.

**Or**

**DSE-1: Microbiological Safety of Foods**

**Credits 06**

**DSE1T: Microbiological Safety of Foods**

**Credits 06**

### **Course Contents:**

Importance and significance of microorganisms in food safety, intrinsic and extrinsic factors affecting the growth of micro organisms in food. Protection and preservation of foods: Hurdle technology, chemical, modified atmosphere, irradiation, thermal and non thermal techniques.

Food borne diseases: characteristics and incidence - global and Indian scenario, food poisoning and food intoxications of microbial origin, bacterial food borne diseases; viral food borne diseases; protozoa animal parasite food borne diseases; mycotoxicoses; mushroom poisoning; investigation and management of food borne diseases.

Food spoilage: characteristic features, dynamics and significance of spoilage of different groups of foods - cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods.

Determination of microorganisms and their products in food: sampling, sample collection, transport and storage, sample preparation for analysis. microscopic and culture dependent

methods- direct microscopic observation, culture enumeration and isolation methods ; culture independent techniques – PCR Based, DGGE, metagenomics, etc.; chemical, physical, immunological methods for microbial metabolites- microbial metabolites.

### **Suggested Readings:**

1. Pelczar, M.I., and Reid, R.D. (2009) Microbiology, 5<sup>th</sup> Ed., McGraw Hill Inc., New York.
2. James, M.J. (2007) Modern Food Microbiology, 2<sup>nd</sup> Ed., CBS Publisher, New Delhi
3. Adams, M.R., and Moss, M.G., (2005) Food Microbiology, 1<sup>st</sup> Ed., New Age International (P) Ltd., NewDelhi.
4. Frazier, W.C. (2008) Food Microbiology, 4<sup>th</sup> Ed., McGraw Hill Inc., NewYork.
5. Doyle, P., Bonehat, L.R. and Mantville, T.J. (2007) Food Microbiology, Fundamentals and Frontiers, ASM Press, WashingtonDC.

**Or**

**DSE-1: Food Sanitation and Hygiene**

**Credits 06**

**DSE1T: Food Sanitation and Hygiene**

**Credits 04**

### **Course Contents:**

1. The relationship of micro organisms to sanitation. Role of microbiology – Environmental effects of microbial growth. Effects of micro- organisms on food degradation and food borne illnesses- bacteria, virus, molds, yeasts, and parasites.
2. Other food hazards – chemicals, antibiotics, hormones, metal contamination poisonous foods.
3. Food contamination- sources and transmissions. Water, air, sewage and soil as reservoirs of infection and ways of spread. Other agents of contamination - Humans, domestic animals, vermins, birds.
4. Importance of personal hygiene of food handler - habits -clothes, illness. Education of food handler in handling and serving food.
5. Safety in food procurement, storage, handling and preparation – control of spoilage – safety of left over foods.
6. Cleaning methods – sterilization, and disinfection –products and methods –use of detergents, heat, chemicals, and tests for sanitizer strength.
7. Control of infestation: rodent control- rats, mice; vector control- use of pesticides

8. Food sanitation, control and inspection-planning and implementation of training programme for health personnel.

### **DSE1P: Food Sanitation and Hygiene (Lab)**

**Credits 02**

#### **Practical:**

1. Study of personal and environmental hygiene habits of street food handlers. Intervention and result analysis. Project submission and presentation.
2. Preservation of fruits and vegetables for later use-peas, carrots, cauliflower, chutney, soup, pickle, jam, jelly, marmalade, squash.

#### **Suggested Readings:**

1. Textbook of Food and Beverage Management by Sudhir Andrews, Tata Mc Graw Hill, New Delhi.
2. Food Hygiene and Sanitation by S. Roday
3. Essentials of food safety and sanitation by David Ms Swane, Nancy Rue and Richard Linton
4. Essentials of Food Sanitation by Marriott, Norman
5. Food Safety, Sanitation and Personal Hygiene by BC Cook Articulation Committee and the BC Cook Articulation Committee.

### **DSE-2: Quality Assurance in Food Sectors**

**Credits 06**

### **DSE2T: Quality Assurance in Food Sectors**

**Credits 06**

#### **Course Contents:**

Food laboratories : need for food analysis, accreditation of food laboratory, referral laboratories, functions of food analysts, hierarchy of food safety authorities, analysis of food samples and reports, other regulatory provisions pertaining to analysis of food

Validation of analytical methods: Good Laboratory Practices (GLP)- history of GLP, areas of application, facilities, test systems, test and reference items, Standard Operating Procedure (SOP), study performance and reporting.

Analytical method used for quality determination: chemical and physical, microbiological, biochemical and sensory analysis.

Analytical methods of determination of basic food components: protein, saccharides, lipids, vitamins, water, minerals and trace elements, sensory active compounds, anti-nutritive and natural toxic compounds, food additives and food contaminants.

Advanced laboratory techniques: principle, working and application of GC, HPLC, HPTLC, LC/MS, inductively coupled Plasma Mass Spectroscopy and PCR, real time PCR, ELISA, Triple Quadra pole system.

### **Suggested Readings:**

1. The training manual for Food Safety Regulators. Vol. II- Food Safety regulations and food safety management. (2011) Food safety and Standards Authority of India. New Delhi.

**Or**

**DSE-2: Quality Control and Food Standards**

**Credits 06**

**DSE2T: Quality Control and Food Standards**

**Credits 06**

### **Course Contents:**

Principal aspects of sampling of food: Importance of sample collection, sampling tools and containers, sample collection techniques, sampling for microbiological analysis of food, routine versus investigational sampling, quantity of sample to be collected, packaging and sealing of sample, dispatch of sample, documentation and commodity specific sampling procedure.

Codex Alimentarius Commission (CODEX): Introduction, standards, codex of practice, guidelines and recommendations, applying codex standards, Codex India, core functions of National Codex Contact Point, National Codex Committee of India

International Organization of Standardization (ISO): Overview, structure, interpretation and case studies of food safety and Quality management including ISO-22000, ISO-9001:2000, ISO22000:2005, ISO 17025/CODES/GLP, Retailers standards: BRC food and BRC IOP standards, IFS, SQF: 1000, SQF: 2000.

Hazard Analysis Critical Control Point (HACCP): History, structure, pre- requites and principles, HACCP applications, HACCP based SOPs.

Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Agricultural Practice(GAP), Good Veterinary Practice (GVP),Storage and distribution of food, sanitation and safety in food services.

### **Suggested Readings:**

1. The Training Manual for Food Safety Regulators. Vol. II- Food Safety regulations and food safety management. (2011) Food safety and Standards Authority of India. New Delhi

2. Mortimore, S., and Wallace, C., (2005) HACCP: A practical approach, 2<sup>nd</sup> Ed, Aspen Publication
3. Surak, J.G., and Wilson, S. (2007) American Society for Quality, 2<sup>nd</sup> Ed., Quality Press

Or

**DSE-2: Food Quality and Sensory Evaluation** **Credits 06**

**DSE2T: Food Quality and Sensory Evaluation** **Credits 04**

**Course Contents:**

**UNIT- 1: Introduction to quality attributes of food**

- Appearance, flavour, textural factors and additional quality factors.

**UNIT- 2: Gustation**

- Introduction and importance of gustation.
- Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands.
- Mechanism of taste perception.
- Chemical dimensions of basic tastes- sweet, salt, sour, bitter and umami.
- Factors affecting taste quality, reaction time, taste modification, absolute and recognition threshold.
- Taste measurement- Electronic Tongue.
- Taste abnormalities.

**UNIT- 3: Olfaction**

- Introduction, definition and importance of odour and flavor.
- Anatomy of nose, physiology of odour perception.
- Mechanism of odour perception.
- Theories of odour classification, chemical specificity of odour.
- Odour measurement techniques – historical perspective and emphasis on recent techniques-e-nose,etc .Merits and Demerits of each methods.
- Olfactory abnormalities.

**UNIT- 4: Colour**

- Introduction and importance of colour.
- Dimensions of colour and attributes of colour;appearance factors, gloss etc.
- Perception of colour.
- Colour Measurement: Munsell colour system, CIE colour system, Hunter colour system, spectrophotometry and colorimetry etc.
- Colour abnormalities.

**UNIT- 5: Texture**

- Introduction, definition and importance of texture.
- Phases of oral processing.

- Texture perception, receptors involved in texture perception.
- Rheology of foods.
- Texture classification.
- Texture measurement – basic rheological models, forces involved in texture measurement and recent advances in texture evaluation.
- Application of texture measurement in cereals, fruits and vegetables, dairy, meat and meat products.

## **DSE2P: Food Quality and Sensory Evaluation (Lab)**

**Credits 02**

### **Practical:**

### **Content**

1. Training of sensory panel.
2. To perform recognition and sensitivity tests for four basic tastes.
3. To perform analytical and affective tests of sensory evaluation.
4. Recognition tests for various food flavors.
5. Sensory evaluation of milk and milk products.
6. Flavor defects in milk
7. Extraction of pigments from various fruits and vegetables and study the effect of temperature and pH.
8. Texture evaluation of various food samples- crispies / cookies/ biscuits/ snack foods.
9. Textural measurement of various food products using Texture Analyzer.
10. Measurement of colour by using Tintometer/ Hunter Colour Lab etc.
11. Qualitative tests for hydrogenated fats, butter, ghee
12. Platform tests for milk.
13. Quality evaluation of various food stuffs- cereals, pulses, honey, jaggery, sugar, tea, coffee, etc

### **Suggested Readings:**

1. Rao E. S. (2013). Food Quality Evaluation. Variety Books.
2. Pomeranz Y and Meloan CE (2002). Food Analysis – Theory and Practice, CBS Publishers and Distributors, New Delhi.
3. deMan J. (2007). Principles of Food Chemistry, 3<sup>rd</sup> ed., Springer.
4. Meilgard (1999). Sensory Evaluation Techniques, 3<sup>rd</sup> ed. CRC Press LLC, 1999.
5. Amerine, Pangborn & Roessler (1965). Principles of Sensory Evaluation of food, Academic Press, London.