

## FT304 FOOD SAFETY AND MICROBIAL STANDARDS

### Course Description & Objectives:

*This course will impart the knowledge to students about Food safety and microbial standards.*

*By the end of the course students will be able to understand various Food safety and microbial standards and toxins both natural and synthetic used in food processing and Sanitation principles.*

### Course Outcomes:

*By the end of the course, the students will be able to*

- 1. Understand about toxins from bacteria and fungi.*
- 2. Know about different food additives, anti-nutrients, anti-vitamins used in food processing.*
- 3. Understand about heavy metal contamination in foods.*
- 4. Understand about food safety and microbial standardization.*

### UNIT I-Food Spoilage

History of Food spoilage, Food poisoning, Food legislation and Food preservation. Dietarytoxins - Food poisoning, Intoxication, Infection, Classification of toxins. Food borne bacterial toxins - *Clostridium botulinum*, *Clostridium perfringens*, *Staphylococcus*- Types of food involved - toxicity and symptoms - Chemical properties – Environmental conditions Food borne bacterial toxins - *Salmonella*, *Vibrio*, *Escherichia coli*, five groups of *E.coli*, *Bacillus cereus*. Types of food involved - toxicity and symptoms - Chemical properties -Environmental conditions. Food borne bacterial toxins - *Listeria*, *Shigella*, *Yersinia*, *Campylobacter*, *Aeromonas*,*Brucella*,. Types of food involved - toxicity and symptoms - Chemical properties- Environmental condition. Mycotoxins - Types of mycotoxins - Aflatoxins, Patulin, Penicillic acid, Ochratoxin, citrinin, Alternaria toxin - Types of food involved - toxicity and symptoms - Chemical properties -Environmental conditions. Mycotoxins - Sterigmatocystin, Fuminosins, Sambutoxin, Zeralenone, Ergotism,Cyclopiazonic acid, Rubratoxin, Roquefortine - Types of food involved - toxicity and symptoms-Chemical properties - Environmental conditions.

### UNIT II- Introduction to Mycotoxin and metal toxin

Mushroom toxins, Different species of poisonous mushrooms, Poisoning or disorders due to poisonous mushrooms. Control of mycotoxins in food and Food Technology

feed. Algal toxins - Paralytic shell fish poisoning, Ciguatera poisoning, , cyanobacterial toxins, Scombro toxic Fish poisoning, - Types of food involved - toxicity and symptoms - Chemical properties - Environmental conditions. Food borne animal parasites - Protozoans - Giardiasis, Amebiasis, Food borne animal parasites-Flat worms - Taeniasis, Round worms (Trichinosis, Anisakiasis) –Types of food involved - toxicity and symptoms - Chemical properties - Environmental conditions. Food borne viruses - Polio, Hepatitis A and Noroviruses, rota viruses, Prion Diseases - Types of food involved - toxicity and symptoms - Chemical properties –Environmental conditions. Metals as toxins - Heavy metals - Arsenic - Occurrence - detection in foods – Toxicological effects - limits - Cadmium - Occurrence - detection in foods - Toxicological effects – limits - Mercury - Occurrence - detection in foods - Toxicological effects - limits. Lead, Tin, Zinc, Aluminium, Chromium, Cobalt, Antimony - Occurrence - detection in foods - Toxicological effects – limits.

#### **UNIT III- Pesticide and Antinutrients in food**

Pesticides - Chlorinated pesticides and non-chlorinatepesticides - Decontamination of food commodities of their insecticide residues. Movement of Residues in the environment. Pesticides - Mechanisms of Toxicity-Residues in Food, Acceptable daily intakes, Maximum residue limits. Antinutrients - Toxic phenolic substances, Flavonoids, tannins, - Toxicity and symptoms – Chemical properties - Type of foods involved - Prevention. Antinutrients - Saffrole, Cyanogenic glycosides, Glucosinolates, favism, Lathyrism, Canavanine, Goitrogens, Caffeic acid &chlorogenic acid, Glycoalkaloids, Saponins. Anti-nutritive factors -Type Aantinutritives - antiproteins- Protease inhibitors - Lectins - Type B antinutritives - antiminerals - Phytic acid - Oxalic acid - Glucosinolates – Diterfiber- Gossypol - Type C antinutritives - anti vitamins - Ascorbic acid oxidase – Antithiamine factors - Antipyridoxine factors. Anti-microbial agents - common anti-microbial food agents - Benzoic acid - Benzoates -Sorbic acid - Sorbates - Short chain organic acids - acetic acid - lactic acid – propionic acid - citric acid - parabens - sulfite - nitrite. Anti-microbial agents - Natural antimicrobial substances present in foods (Indirect antimicrobials) - Antioxidants, Flavouring agents, spices and essential Oils, phosphates, Medium chain fatty acids and esters, acetic and lactic acid. Anti-microbial agents - Antibiotics (, natamycin, tetracyclins, Subtilin, Nisin,), Antifungal agents for fruits, Ethylene and propylene Oxides

#### **UNIT IV - Food safety and HACCP**

Antimicrobial agents - Miscellaneous chemical preservatives - Chitosans, Dimethyl bicarbonate, Ethanol, Glucose oxidase, Polyamino acids.

Bacteriophages as biocontrol agents, hurdle concept. Sanitation - GMPs - Personal hygiene - Sanitizers - Sanitation principles – Sanitizing methods - Sanitation agents - Chlorocompounds- Iodocompounds - Bromocompounds – Acid and alkali compounds. Sanitation - Ozone, hydrogen peroxide, Acidified sodium chlorite- Factors influencing efficacy of sanitizers. Food safety- Indicators of food microbial Quality and safety - Coliforms, Enterococci, Bifidobacteria, Coliphages/Enteroviruses, predictive Microbiology/ Microbial modeling. Risk assessment and management during food preparation - HACCP – prerequisite programmes, definitions, HACCP principles, Flow diagrams, Application of HACCP principles, Limitations of HACCP. Risk assessment and management during food preparation - Food safety Objective (FSO), Microbiological criteria, definitions, sampling plans. Microbiological criteria for various food products

#### **UNIT V - Food laws & Standards**

Food laws & Standards - FAO, Codex Alimentarius, ISO, Indian food laws and standards, Prevention of Food adulteration (PFA) act, Fruit Products Order (FPO), Meat product order (MPO), Cold storage order (CSO), BIS, Agmark. Non permitted food additives - Allura red AC, Aspartame, amaranth, Benzoic acid, brilliant black, Butylated Hydroxy - anisole, Calcium benzoate, Calcium sulphite. Non permitted food additives- Monosodium glutamate (MSG) Ponceau 4R, Cochineal Red A, Potassium benzoates, Potassium nitrate, Propyl p-hydroxybenzoate, propyl paraben, and paraben. Non permitted food additives - Saccharin & its Na, K and Ca salts, Sodium metabisulphite, Sodium sulphite, Stannous chloride (tin), Sulphur dioxide, Sunset Yellow FCF, Orange Yellow S, tartrazine.

#### **TEXTBOOKS:**

1. James M. Jay, Martin J. Loessner and David A. Golden; *Modern Food Microbiology*, 1999.
2. John de Vries *Food Safety and Toxicity* CRC Press, 2000

#### **REFERENCES:**

1. Wisconsin- Madison 1995, *Food Safety*, Food Research Institute University.
2. N.G Marriott (1985), *Principles of Food Sanitation*, AVI Pub. Co. USA.
3. PS Diamond and R.F Denmen *Laboratory techniques in chemistry and biochemistry*, 2004.