DEPARTMENT OF FOOD AND INDUSTRIAL MICROBIOLOGY

Sr. No.	Course No.	Course Title	Credits	Semester
1.	FIM-111	Fundamentals of Microbiology	3 (2+1)	I
2.	FIM-122	Food Microbiology	3 (2+1)	II
3.	FIM-233	Fermentation and Industrial Microbiology	3 (2+1)	III
4.	FIM-244	Food Safety and Microbial Standards	3 (2+1)	IV
5.	FIM-355	Food Bio-technology	3 (2+1)	V
6.	FIM -366	Food Hygiene and Sanitation	3 (2+1)	VI
		Total credits	**18 (12+6)**	

DEPARTMENT OF FOOD AND INDUSTIRAL MICROBIOLOGY

FIM-111 Fundamentals of Microbiology 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Evolution and scope of Microbiology	2
2	General morphological, cultural characteristics and reproduction of bacteria, yeasts, molds, actinomycetes, algae, protozoa, and rickettsia	5
3	Nutrient transport phenomenon and physiology of microorganisms	4
4	Genetic recombination, transduction, transformation and bacterial conjugation, mutation and mutagenesis	4
5	Growth curve: Physical and chemical factors influencing growth and destruction of microorganisms (including thermal death time, Z, F and D values)	4
6	Viruses: Structure and replication with particular reference to food borne viruses.	4
7	Control of Microorganisms by physical and chemical agents, antibiotics and other chemotherapeutic agents	4
8	Preservation of microbial cultures	3
	Total	**30**

Practicals

No. of Units	Topics	No. of Experiments
1	Microscopy	1
2	Micrometry	1
3	Cleaning and sterilization of glassware	1
4	Preparation of nutrient agar media and techniques of inoculation	1
5	Staining methods (monochrome staining, negative staining, capsule-staining, flagella staining and endo spore staining)	2
6	Pure culture techniques (streak plate/pour plate)	2
7	Introduction to identification procedures (morphology and cultural characteristics)	2
8	Growth characteristics of bacteria: Determination of microbial numbers, direct plate count, generation time	2
9	Factors influencing growth: P_H, temperature, growth curves for bacteria	1

10	Methods of microbial culture preservation for bacteria and yeasts.	1
11	Anaerobic culture methods	1
	Total	**15**

REFERENCE BOOKS

1 Fundamentals of Microbiology	Martin Frobisher, Sc.D.
2 Text Book of Microbiology	Bob A. Freeman
3 Microbiology, a Text Book	Prof. Kamal, A.K. Shrivastava and G.P. Rao
4 Microbiology	M.J. Pelczar Jr., E.C.S. Chan and N.R. Krieg.
5 Biology of Microorganisms	T.D. Brock
6 General Microbiology	Singh B. D., Nallari P., Kavikishore P. B and Singh R. P.
7 Microbiology Fundamentals and Applications	Purohit S. S.
8 Microbiology	Prescott, Harley and Klein
9 Practical Microbiology	G. Sirockin and S. Callimore
10 Microbes in Action. A laboratory manual of microbiology	H.E. Salley , Jr & A.T. Van Denmak

FIM-122 FOOD MICROBIOLOGY 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Microbial spoilage of foods	2
2	Chemical changes caused by microorganisms	1
3	Principles of food preservation	1
4	Control of microorganisms by use of low and high temperature	4
5	Asepsis, water activity , drying, preservatives, radiation and pressure for control of microorganisms	4
6	Microbiology of milk and milk products Sources of contamination, spoilage and prevention	2
7	Microbiology of fruits and vegetables Sources of contamination, spoilage and prevention	2
8	Microbiology of cereal and cereal products. Sources of contamination, spoilage and prevention	2
9	Microbiology of meat and meat products. Sources of contamination, spoilage and prevention	2
10	Microbiology of fish and other sea foods	2

	Sources of contamination, spoilage and prevention	
11	Microbiology of poultry and eggs Sources of contamination, spoilage and prevention	2
12	Microbiology of sugar and sugar products Sources of contamination, spoilage and prevention	2
13	Microbiology of salts and spices Sources of contamination, spoilage and prevention	2
14	Microbiology of canned foods Sources of contamination, spoilage and prevention	2
	Total	**30**

Practicals

No. of Units	Topics	No. of Experiments
1	Isolation of molds from foods	2
2	Microbial examination of cereal and cereal products Identification, isolation and confirmation of *R. nigricans*	2
3	Microbial examination of vegetable and fruits Identification, isolation and confirmation of *R. nigricans/Erwinia carotovora*	2
4	Microbial examination of meat and meat products Identification, isolation and confirmation of *Coliform* bacteria/*P.fluorescens*	2
5	Microbial examination of fish and other sea foods Identification, isolation and confirmation of *Proteus*	2
6	Microbial examination of Eggs and poultry Identification, isolation and confirmation of *Pseudomonas fluorescens*	2
7	Microbial examination of milk and milk products Identification, isolation and confirmation of *S.thermophilus*	1
8	Microbial examination of sugar, salts and spices Identification, isolation and confirmation of *L.messenteroides/L.dextranicum*	1
9	Thermal Death Time determination	1
	Total	**15**

REFERENCE BOOKS

1 Food Microbiology — W.C. Frazier and D.C. Westhoff
2 Modern Food Microbiology — James M. Jay.
3 Basic Food Microbiology — G.J. Banwart.
4 Applied Microbiology — Singh B. D., Nallari P., Kavikishore P. B and Singh R. P.
5 Food Microbiology (vol. I & II) — Adams M.R. and Moss M.O.
6 Food Microbiology and Lab Practice — Bell

FIM-233 FERMENTATION AND INDUSTRIAL MICROBIOLOGY 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Microbes as friends, primary and secondary metabolites, screening and isolation of microorganisms, the organizations involved microbiological work	**1**
2	Industrially important secondary metabolites, organic acids, antibiotics, probiotics, compounds of therapeutic and medicinal value	**6**
3	Bacteriocins, nisin, biocolours, carotenoids, B-carotene, lycopane, ang kak, production of microbial enzymes, down stream processing of enzymes and application of microbial enzymes in food and allied industries	**6**
4	Production and purification of microbial polysaccharides, and their applications production of important amino acids, vitamins and bioinsecticides	**5**
5	Plant cell cultures and metabolites, production of SCP, fermented dairy products, bakers yeast	**3**
6	Fermented foods and alcoholic beverages, microbial standards	**3**
7	Industrial fermentors and accessories. (instrumentation)	**2**
8	Economic feasibility studies of few products, advances in strain improvements for high yields of metabolites, blue green algae	**2**
9	Mushrooms – production, preservation and quality	**2**
	Total	**30**

Practicals

No. of Units	Topics	No. of Experiments
1	Standardization of physical factors for higher yields of citric acid	2
2	Production and assay of antibiotics – Penicillin/tetracycline	2
3	Production and assay of β-carotene	1
4	Production of ang kak (Red rice) and estimation of colouring compounds	1
5	Production, purification and assay of fungal analyses / proteases	2
6	Production of xanthan / pullulan	1
7	Production and assay of amino acids	1
8	Production and assay of nisin from lactic acid bacteria	1
9	Single cell protein (SCP) production	1
10	Mushroom production	1
11	Preparation of food based fermented product like miso/Idli/Dhokla	2
	Total	**15**

REFERENCE BOOKS

1 Microbial Technology Vol-I H.J. Peppler and D. Perlman
2 Microbial Technology Vol-II H.J. Peppler and D. Perlman
3 Industrial Microbiology 4th Ed. Prescott and Dunns

FIM-244 FOOD SAFETY AND MICROBIAL STANDARDS 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Hazards in food chain physical, chemical, biological	6
2	Toxins in food, naturally occurring, bacterial and fungal	4
3	Intrinsic toxins produced during processing and storage	3
4	Metals as toxins – sources, contamination, toxicity and elimination	3
5	Pesticide residues as toxin i) Chlorinated ii) Non – chlorinated.	3
6	Permitted and non permitted food additives as and when amended	4
7	Microbial standards of fresh and processed foods.	3

8	Risk assessment and management during food preparation.	4
	Total	**30**

Practicals

No. of Units	Topics	No. of Experiments
1	Estimation of *Salmonella /Sshigella/ Stachyphylococcus* from food samples.	2
2	Estimation of fungal toxins from food samples. (Different types of foods)	2
3	Heavy metal detection (lead)	2
4	Isolation and identification of *Listeria* and *E. Coli*	2
5	HACCP for food industries by taking few models	2
6	Study of national and international microbial quality standards	2
7	Visit to export oriented food processing industry	2
8	Microbial and chemical analysis of water	2
	Total	**15**

REFERENCE BOOK

1 Food Hygiene and Sanitation S. Roday
2 Food Microbiology W.C. Frazier and D.C. Westhoff
3 Food Chemistry (New Edition) Owin R. Fenema
4 Handbook of Food Toxicology S.S. Deshpande
5 Food Microbiology M.R. Adams and M.O. Moss
6 Food Additives Toxicology J.A. Maga and A.T. Tu
7 Safety of Foods (II Edition) H.D. Graham

FIM-355 FOOD BIO-TECHNOLOGY 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Prospectus of Bio-Technology	2
2	Molecular genetics i.e. fundamentals of molecular biology with special reference to chemistry and biology and DNA. (Primary secondary and tertiary) structures	3
3	Biological role of DNA in cell metabolism	2
4	Genetic recombination mechanisms and technique used for improvement in microbial strains	2
5	Applications of genetic control mechanism in industrial fermentation process, (Induction, manipulation and recombination)	2

6	Recombinant-DNA technology (plasmids and cloning)	2
7	Cell and tissue culture	2
8	Continuous cultures	2
9	Secondary metabolites synthesis	2
10	Expression of foreign genes. promoter (Enzyme), biomass production by using various micro organisms	3
11	Application of Biotechnology in food (Food industries), pharmaceuticals and agriculture	3
12	Bio-gas plant	2
13	Bio technology approach for the exploitation of food and industrially important microorganisms	3
	Total	**30**

Practicals

No. of Units	**Topics**	**No. of Experiments**
1	Study of auxotroph	1
2	Micro propagation through tissue culture	1
3	Strain improvement through U.V. mutation for lactose utilization	2
4	Chemical mutagenesis using chemical mutagens (Ethidium bromide)	2
5	Determination of survival curves using physical and chemical mutagens	2
6	Isolation and analysis of chromosomal / genomic DNA from *E.coli and Bacillus cereus*	2
7	Separation of protoplast using cellulytic enzymes	2
8	Introduction of ELISA / Southern blot / DNA finger printing etc	1
9	Agarose gel electrophoresis of plasmid DNA	1
10	Pesticide degradation by pseudomonas spp	1
	Total	**15**

REFERENCE BOOKS

1 Advances in Biotechnology Vol.1 (Scientific and Engineering principles) — Murayy Moo-Young C.W. Gambell and C.Vezina

2 Advances in Biotechnology Vol-II (Fuels, chemicals, foods and waste treatments) — Murayy Moo-Young C.W. Gambell and C.Vezina

3 Advances in Biotechnology Vol-III (Fermentation Products) — Muray Moo-Young

4 VIIth International Biotechnology Symposium (Feb 19-25 1984) held at New Delhi-Part-I

5 VIIth International Biotechnology Symposium (Feb. 19-25 1984) Held at New Delhi Part-II.

6 Microbial Technology-Vol-I (Microbial Process) — Peppler and Perlman

7	Microbial Technology-Vol-I I (Fermentation Technology)	Peppler and Perlman

FIM-366 FOOD HYGIENE AND SANITATION 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Principles of Food Hygiene, hygiene in urban and rural areas with respect to food preparations.	2
2	Food handling habits and personal hygiene	2
3	Sources of water and impurities in water, hardness of water.	2
4	Water supply systems and water purification, chlorination	2
5	Types of Soil (Food residues on equipment surfaces) and its properties.	2
6	Cleaning procedures, types of cleaning agents and their properties.	2
7	Acid and alkaline cleaners.	2
8	Types of sanitizing agents and their properties.	2
9	**Mid Semester Examination**	

10	Chlorine, iodine and their compounds as a sanitizers, Quaternaly ammonium compounds, phonolic compounds as sanitizers. Advantages and disadvantages of these sanitizers.	2
11	Physical sanitizing agents example Hot water, Steam and UV light.	2
12	Sanitation facilities and procedures in food plant operations. CIP system.	2
13	Cleaning premises and surroundings. Common Pests in food services rodents, insects, birds, house flies, cockroaches, ants and their control.	2
14	Sanitation regulations, phytosanitary requirements.	2
15	Hygiene and sanitation of preparation, storage and retail shops.	2
16	Plant and equipments design, requirements for ease in maintenance of hygiene and sanitation	2
17	Study of food sanitation check lists.	2
	Total	32

Practicals

No. of Units	Experiments	No. of Experiments
1	Microbial quality of air	1
2	Microbial load of palm/ fingers, nose secretions of workrs TPC/*E.Coli* / Vibrio- contienue.	2
3	Microbial load of palm/ fingers, nose secretions of workrs TPC/*E.Coli* / Vibrio- continue.	3
4	Microbial quality of eating utensils- continue	4
5	Microbial quality of eating utensils	5
6	Visit to water purification plant	6
7	Determination of micro-organisms as sanitary indicator ropiness/ moldiness of bread - continue	7
8	Determination of micro-organisms as sanitary indicator ropiness/ moldiness of bread	8
9	**Mid Semester Examination**	
10	Testing of sanitizers, disinfectants for antimicrobial activity- continue	9
11	Testing of sanitizers, disinfectants for antimicrobial activity	10
12	Study of phenol coefficients of sanitizers- continue	11
13	Study of phenol coefficients of sanitizers	12
14	Visit to District public health laboratory and preparation of visit report	13
15	Investigation of organisms involved in infections, diseases vibrio typhoid.	14
16	Visit to restaurents/ local food industries and preparatin of visit	15

	report on prevailing conditions of hygiene	
17	Methods of pest control in food industries rodents / cockroaches	16

REFERENCE BOOK

1 Guide to improving Food Hygiene - Ed Gaston & Tiffney

2 Practical Food Microbiology and - Harry H.Weiser,J.mountney and W.W.Gord Technology (2nd edition)

3 Food Poisoning and Food Hygene (3rd Edition) -Betty C.Hobbs

4 Principles of Food Sanitatin - Marriott. Norman G.

5 Hygiene in food manufacturing and Handling - Barry Graham- Rack and Raymond Bmsted