

GUJARAT VIDYAPEETH : AHMEDABAD

M.D. Gramseva Mahavidyalaya, Sadra,

Dist: Gandhinagar

Department of Microbiology

Semester-VI

GUJARAT VIDYAPEETH : AHMEDABAD

**M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar
Department of Microbiology**

Semester-VI

(In Force from December 2012)

MIC-601- Fermentation Technology (1)

(Syllabus of theoretical portion) (In force from June, 2010)

Total Mark: 50= External Evaluation: 40 Marks +

Internal Evaluation: 10Marks)

(Total Teaching Hours=30, Credit=02)

UNIT:1.	FERMENTATION TECHNOLOGY-1.	(10 HOURS)
1.	Introduction To Fermentation Process	(02 lectures)
	a. Stages in the Development of Fermentation Process (Component Parts)	
	b. Range Of Fermentation Processes	
2.	Fermentation Media	(03 lectures)
	a. Media Formulation	
	-Principles	
	-Raw Materials Used	
	-Criteria for Selection of Raw Materials	
	b. Media Ingredients: Water, Carbon source, Nitrogen source, Minerals, Vitamins, and Growth Factors, Precursors, Inhibitors, Inducers, and Cell Permiability modifiers	
3.	Oxygen Requirements and Antifoam Agents	(01 lecture)
4.	Sterilization.	(04 lectures)
	a. Need for Asepsis, Protected Fermentation	
	b. Medium sterilization	
	-Use of High Pressure Steam: D value and its significance, actorsaffecting D Value, Batch and Continuous sterilization	
	-Use of Filtration: Mechanism of Filtration, Types of Filters- Fixed pore and non fixed pore Filters	
	c. Sterilization of Fermenter, feed , Liquid waste , air and Exhaust air.	
UNIT:2.	FERMENTATION TECHNOLOGY-2.	(10 HOURS)
A.	Inoculum Development	(02 Lectures)
	1. General Principles	
	2. Development of Inoculum For Yeast Processes.	
	3. Development of Inoculum For Bacterial Processes.	
	4. Development of Inoculum For Mycelial Processes.	
B.	Fermenter Design	(02 Lectures)
	1. Basic Functions of a Bioreactor	
	2. Design and Consruction of Stirred tank Bioreactor	

- Devices for aeration, agitation, Monitoring ,
sampling and feed ports.
- 3. Concept of Operating Modes **(01 Lecture)**
 - Batch culture fermentation
 - Fed batch culture
 - Continuous culture fermentation
- 4. Bioreactors Meant for specific purpose **(03 Lectures)**
 - Batch reactors, Continuous flow reactors,
packed bed reactors, Fluidized bed Reactors
- C. Fermenter Control and Monitoring **(01 Lecture)**
 - 1. Aseptic Operation and Containment
 - 2. Achievement and Maintainance of Asepsis
 - 3. Control of Process parameters: Temp.,
Ph, Dissolved oxygen, Pressure and Foam
- D. Aeration and Agitation **(01 Lecture)**
 - 1. Need for aeration and agitation
 - 2. Mass transfer of Oxygen and Factors affecting it
 - 3. Kla and its Significance
- E. Introduction to Scale up and Scale down **(01 Lecture)**
 - 1. Inoculum development
 - 2. Sterilization
 - 3. Aeration and Agitation.

UNIT:3. SCREENING AND STRAIN IMPROVEMENT (10 HOURS)
 (A) Primary screening methods **(03 Lectures)**
 (B) Strain improvement techniques **(07 Lectures)**

REFERENCE BOOKS OF PAPER FERMENTATION TECHNOLOGY-1

1. Principles of fermentation technology by P.F. Stanbury, A. Whitaker and S.J. Hall 2nd edition, 1997, Pergamon
2. Industrial Microbiology, an introduction by M.J. Waites, N.L. Morgan et al, 1st Indian Reprint 2002, Blackwell Science
3. Biotechnology: A Textbook of Industrial Microbiology by W. Crueger and A. Crueger 2nd edition, 2000, Panima Publishing Corporation
4. Fermentation Microbiology and Biotechnology by E.M.C.EI Mansi and C.F.A Bryce Taylor and Francis, Reprint, 2002, Replika Press Pvt Ltd
5. Biotechnology; the Biological Principles by Trevan, 2nd reprint, 1990, Tata McGraw Hill
6. Industrial Microbiology by L.E. Casida, 4th reprint, 1991, John Wiley and Sons
7. Fermentation Technology Vol-I H.A.modi Pointer Publications, Jaipur, 2009

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MIC-602- Fermentation Technology-2
(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

UNIT:1. FERMENTATION TECHNOLOGY-3a	(08 HOURS)
1. Down Strem Processing	(01 Lecture)
2. Cell Harvesting	(02 Lectures)
- Broth conditioning	
- Foam separation	
- Sedimentation	
- Filtration	
- Centrifugation	
3. Cell Disruption: Mechanical methods and Non Mechanical Methods	(03 Lectures)
4. Product Concentration	(02 Lectures)
- Liquid- Liquid extraction	
- Precipitation	
- Solubilization	
UNIT:2. FERMENTATION TECHNOLOGY-3b	(07 HOURS)
1. Product Recovery	(02 Lectures)
- Chromatography	
- Membrane Processes: Ultra filtration. Reverse Osmosis, - Liquid Membranes	
2. Finishing stages	(01 Lecture)
-Crystallization	
-Drying	
3. Product Quality and Safety	(02 Lectures)
1. Introducion	
2. Quality assurance	
- Principles of Bioassay	
- Sterility testing	
- Pyrogen testing by LAL test	
3. Manufacturing and Environment safety	
- Containment	
- Clean room environment	
4. Introduction to fermentation economics.	(02 Lectures)
UNIT:III. Typical Fermentations (1)	(07 HOURS)
Fermentative production of Biomass	
1. Single Cell Protein	
(1) Microbial Enzymes	(03 Lectures)

1. Amylase
2. Protease Microbial Metabolites
- (2) Transformation Products **(02 Lectures)**
 - Introduction to steroid transformation
- (3) rDNA Products **(02 Lectures)**
 1. Introduction to Vaccines and Insulin
- UNIT:IV. Typical Fermentations (2) (08 HOURS)**
- (2). Primary Metabolites
 - Citric Acid
 - Ethanol
 - Vitamin B₁₂
 - Lysine
 - Xanthan
2. Secondary Metabolites
 - Penicillin

REFERENCE BOOKS OF PAPER FERMENTATION TECHNOLOGY-2

1. Principles of fermentation technology by P.F. Stanbury, A. Whitaker and S.J. Hall 2nd edition, 1997, Pergamon
2. Industrial Microbiology, an introduction by M.J. Waites, N.L. Morgan et al, 1st Indian Reprint 2002, Blackwell Science
3. Biotechnology: A Textbook of Industrial Microbiology by W. Crueger and A. Crueger 2nd edition, 2000, Panima Publishing Corporation
4. Fermentation Microbiology and Biotechnology by E.M.C.EI Mansi and C.F.A Bryce Taylor and Francis, Reprint, 2002, Replika Press Pvt Ltd
5. Biotechnology; the Biological Principles by Trevan, 2nd reprint, 1990, Tata McGraw Hill
6. Industrial Microbiology by L.E. Casida, 4th reprint, 1991, John Wiley and Sons
7. Fermentation Technology Vol-II H.A.modi, 2009
Pointer Publications, Jaipur

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(In Force from June-2010)
MIC-603- : Immunology and Medical Microbiology
(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

Unit	Topics	Hours
1	i. Immunity – introduction to types of immunity- innate and acquired, active and passive, natural and artificial, herd immunity	3
	ii. Antigen and immunogenicity: definition, character of immunogens, antigenic determinants, adjuvants, types of antigens, bacterial antigens	2
	iii. Immunoglobulins: general characters, basic structure of immunoglobulins, classes of Igs and their physico chemical and biological characteristics	2
	iv. Monoclonal antibodies and their applications	1
2	i. Introduction & types of autoimmune disorders	1
	ii. Immune deficiency- congenital and acquired	2
	iii. Hypersensitivity - introduction and types of hypersensitivity	2
	iv. Transplantation immunity- MHC antigens, Donor-recipient matching, Graft rejection	1
	v. Tumor immunity	1
3	i. Normal flora of body- role, origin and establishment, normal flora of different systems, germ free animals and gnotobiosis	4
	ii. Natural resistance and nonspecific host defences- species, racial, individual resistance and external defence mechanisms.	1
	iii. Internal defence mechanisms- complement system, phagocytosis, Natural killer cells, interferon, inflammatory response	3
4	i. Host Parasite interactions- dynamicity of host parasite relationship, factors affecting, infective process, types of infection, nosocomial infections, virulence factors of microorganisms	3
	ii. Epidemiological techniques- markers; Role of host in infectious diseases	2
	iii. Airborne transmission-droplets and droplet nuclei, infectious dust, epidemiology of influenza, hazards of aerosols in clinical microbiology laboratory; Waterborne	2

transmission; Foodborne transmission- epidemiology of foodborne intoxications and infections; Transmission by direct contact- person to person contact, blood or blood products, direct contact with animals and wound infections; Arthropod borne transmissions

References:

1. Microbiology, (5th Ed.) – Prescott
2. Microbiology, (2nd Ed.) – R.M. Atlas
3. Microbiology, (3rd Ed.) – Tortora
4. Introduction to Medical Laboratory Technology, (7th Ed.) – F. J. Baker, R. E. Silvertown, C. J. Pallister
5. Medical Laboratory Technology – K .L. Mukherjee
6. Immunology – Kuby
7. Immunology – Roitt

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MIC-604- Food, Dairy And Veterinary Microbiology
(Syllabus of theoretical portion) (In force from June, 2010)

Total Mark: 50= External Evaluation: 40 Marks +

Internal Evaluation: 10Marks)

(Total Teaching Hours=30, Credit=02)

UNIT : 1. FOOD MICROBIOLOGY

(08 HOURS)

- (a) microbial flora of fresh foods.
- (b) microbial spoilage of food : role of microorganisms in food spoilage, spoilage of fresh and canned foods.
- (c) food poisoning : sources of contamination and introduction to food poisoning. Role of *Clostridium botulinum*, and *Salmonella spp.* As Food poisoning agents.
- (d) preservation of food : general principles, methods of preservation.

UNIT : 2. FERMENTED FOOD

(07 HOURS)

- (a) Use of aseptic handling _ high temperature, Pasteurization, sterilization, canning, low temperature dehydration, Osmotic pressure, developed and added preservatives, radiations.
- (b) fermented foods : pickles, sauerkraut
- (c) introduction to Indian fermented foods.
- (d) Microorganisms as food: mushrooms and single cell proteins.

UNIT : 3 DAIRY MICROBIOLOGY**(07 HOURS)**

1. Milk borne disease **(02 HOURS)**
2. Microbiology of starter cultures **(02 HOURS)**
3. Microbiology of cheese and fermented milk products **(02 HOURS)**
4. Probiotics **(01 HOURS)**

UNIT : 4 VETERNARY MICROBIOLOGY**(08 HOURS)**

1. Bacterial diseases of domestic animals **(03 HOURS)**
2. Viral diseases of domestic animals **(03 HOURS)**
3. Fungal diseases of domestic animals **(02 HOUR)**

REFERANCE BOOKS

1. Microbiology, Pelzar, M.J. Chan, E.C.S.,Krig N.R.: Mc Graw Hill Book Company
2. General microbiology, Stainer R.Y., Ingraham Wheelis, M.L.Painter, P.R. Mac Millan India.
3. Introduction to Microbiology by J.L. Ingraham and C.A. Ingraham, 2000
4. Microbiology by J,G, Black, 2002
5. Introductory food microbiology (Dr.HA.Modi (2007) Avishkar Printers, Jaipur, (India)
6. food microbiology K.Vijaya Ramesh (2007) MJP Publishers Chennai
7. Dairy microbiology Avishkar publishers Jaipur, India Dr.H A.Modi (2009)
8. Textbook of Veternary microbiology S.sharma and S.Adalakha (1996) Vikas publishers

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MIC-605 Project/Field Work

(Syllabus of theoretical portion) (In force from June, 2010)

Total Mark: 50= External Evaluation: 40 Marks +

Internal Evaluation: 10Marks)

(Total Teaching Hours=30, Credit=02)

*** The Candidate should select project or field work from the following research areas.**

- i. Bioenergy
- ii. Composting/Vermicomposting
- iii. Organic Farming
- iv. Waste water treatment
- v. Rural sanitation and public hygiene
- vi. Herbal plants (Antimicrobial agents)
- vii. Food, Dairy and Veterinary microbiology
- viii. Biodegradation of organic wastes/Pesticides
- ix. Environmental microbiology
- x. MPN analysis of water
- xi. Mineral water pouches-Microbiological analysis
- xii. Study of micro flora of air
- xiii. Study of micro flora of Coins

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(In force from December-2012)

Paper No:- ENG-601

Paper Name:- English

(Syllabus of theoretical portion)

Total Marks: 50 (External evaluation : 40 marks)

(Internal evaluation : 10 marks)

Credit :- 2

Time duration:- 30 hours/Paper/Semester

Unit-1 Text **(35%)**

Fantasy Collection of Short stories, Orient Blackswan,
Edited by V. Sasikumar.

Lesson:

- (1) The Gold Frame
- (2) The man who liked Dickens.
- (3) Marriage is a Private Affair
- (4) The Verger.
- (5) The Moon in the Earthen Pot.

Unit-2 Vocabulary **(15%)**

- (1) Match the words with their correct meaning.
- (2) Make meaningful sentences by using the words.
- (3) Use idiomatic phrase/expression in your sentences.

Unit-3 Grammar **(25%)**

- (1) Transformation (voice, speech) (paragraph base)
- (2) Adjective clause & Adverb clause

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EC-601- Diagnostic Immunology
(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

Unit	Topics	Hours
1	i. Specimens- types, collection, handling and transport	3
	ii. Identification of microorganisms from specimens: Microscopic, growth and biochemical characteristics, phage typing, susceptibility testing, rapid identification techniques, molecular methods and metabolic products and name of serological/immunological techniques	6
2	i. General symptoms, transmission and control of infection (<i>Corynebacterium, Mycobacterium, Treponema, Gonorrhoea, Clostridium, Salmonella, Vibrio, Staphylococcus & Streptococcus</i>)	6
3	i. Diagnostic immunology: Antigen antibody reactions- Types, mechanism and zone phenomenon	2
	ii. In vivo antigen-antibody reactions immune count word formation. Complement fixation- classical and alternate pathways, neutralization, virus neutralization, opsonization	4
4	i. In vitro antigen antibody reactions: precipitation, agglutination, complement fixation, ELISA, RIA, RAST, Immunofluorescence, Western Blot, Skin tests	5
	ii. Prophylactic immunization: Introductory characters and types of vaccines, schedule of vaccination, hazards of vaccination	4

References:

1. Microbiology, (5th Ed.) – Prescott
2. Microbiology, (2nd Ed.) – R.M. Atlas
3. Microbiology, (3rd Ed.) – Tortora
4. Introduction to Medical Laboratory Technology, (7th Ed.) – F. J. Baker, R. E. Silvertson, C. J. Pallister
5. Medical Laboratory Technology – K .L. Mukherjee
6. Medical Laboratory Technology – Godkar

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EC-602- Food Safety
(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

Unit	Topics	Hours
1	Prerequisite programs, facility design, SOPs, common foodborne illnesses, responsibilities related to food safety	7
2	Food defense: federal action to protect food, possible outside threats, Introduction to HACCP	8
3	Hazard analysis: biological, chemical, physical; determination of critical control points, establishing monitoring procedures	9
4	Verification of HACCP system, Record keeping and documentation, Control for safety food, information on bovine spongiform encephalopathy (BSE), variant Creutzfeldt-Jakob disease (vCJD), and the avian influenza (bird flu), and avian influenza A (H5N1) virus as communicated by the CDC	6

Reference:

The HACCP food safety training manual, Published by John Wiley & Sons, Inc., Hoboken, New Jersey.