GUJARAT VIDYAPEETH : AHMEDABAD

M.D. Gramseva Mahavidyalaya, Sadra,
Dist: Gandhinagar

Department of Microbiology

Semester-VI
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

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.

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

2. Industrial Microbiology, an introduction by M.J. Waites, N.L. Morgan et al, 1st Indian Reprint 2002, Blackwell Science
5. Biotechnology; the Biological Principles by Trevan, 2nd reprint, 1990, Tata McGraw Hill
UNIT:1. FERMENTATION TECHNOLOGY-3a (08 HOURS)

1. Down Stream 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
     Reverse Osmosis, Liquid Membranes
2. Finishing stages (01 Lecture)
   - Crystallization
   - Drying
3. Product Quality and Safety (02 Lectures)
   1. Introduction
   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 (03 Lectures)
   (1) Microbial Enzymes
1. Amylase
2. Protease Microbial Metabolites

(2) Transformation Products
- Introduction to steroid transformation

(3) rDNA Products
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

2. Industrial Microbiology, an introduction by M.J. Waites, N.L. Morgan et al, 1st Indian Reprint 2002, Blackwell Science
5. Biotechnology; the Biological Principles by Trevan, 2nd reprint, 1990, Tata McGraw Hill
### GUJARAT VIDYAPEETH : AHMEDABAD
M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar
Department of Microbiology
Semester-VI
(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)

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

REFERENCE BOOKS

5. Introductory food microbiology (Dr.H.A.Modi (2007) Avishkar Printers, Jaipur, (India)
6. food microbiology
7. Dairy microbiology Avishkar publishers Jaipur, India
   Dr.H A.Modi (2009)
8. Textbook of Veterinary microbiology
   S.sharma and S.Adalakha (1996) Vikas publishers
GUJARAT VIDYAPEETH : AHMEDABAD

M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar

Department of Microbiology

Semester-VI

(In Force from December 2012)

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
GUJARAT VIDYAPEETH : AHMEDABAD
Department of Microbiology
M.D. Gramseva Mahavidyalaya, Sadra, Dist. Gandhinagar
Semester-VI
(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.

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
GUJARAT VIDYAPEETH : AHMEDABAD  
M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar  
Department of Microbiology  
Semester-VI  
(In Force from December 2012)  
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)

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

References:

1. Microbiology, (5th Ed.) – Prescott  
3. Microbiology, (3rd Ed.) – Tortora  
5. Medical Laboratory Technology – K. L. Mukherjee  
6. Medical Laboratory Technology – Godkar
GUJARAT VIDYAPEETH : AHMEDABAD  
M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar  
Department of Microbiology  
Semester-VI  
(In Force from December 2012)  
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)

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<tr>
<td>1</td>
<td>Prerequisite programs, facility design, SOPs, common foodborne illnesses, responsibilities related to food safety</td>
<td>7</td>
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<tr>
<td>2</td>
<td>Food defense: federal action to protect food, possible outside threats, Introduction to HACCP</td>
<td>8</td>
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<td>3</td>
<td>Hazard analysis: biological, chemical, physical; determination of critical control points, establishing monitoring procedures</td>
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<td>4</td>
<td>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</td>
<td>6</td>
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</table>

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