GUJARAT VIDYAPEETH : AHMEDABAD

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

Department of Microbiology

Semester-V

(In Force from June-2012)
### GUJARAT VIDYAPEETH : AHMEDABAD

M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar
Department of Microbiology
Semester-V
(In Force from June-2012)

**MIC-501- Introduction to Bacterial Genetics-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)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>i. Principles of inheritance - relevance of Mendelian laws</td>
<td>2</td>
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<tr>
<td></td>
<td>ii. Nature of genetic material: gene structure and function, arrangement</td>
<td>6</td>
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<tr>
<td></td>
<td>and linkage, gene complementation, cistron, concept of intron and exon,</td>
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<tr>
<td></td>
<td>one gene one polypeptide theory, structures of DNA, organization of</td>
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<td></td>
<td>bacterial chromosome. Microorganisms as genetic tools</td>
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<tr>
<td>2</td>
<td>i. Experiments to prove NA as inheritance material</td>
<td>2</td>
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<td></td>
<td>ii. Semi-conservative mode of chromosome replication, work of Messelson</td>
<td>1</td>
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<tr>
<td></td>
<td>and Stahl</td>
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<td>iii. Molecular mechanism of chromosome replication, origin of replication,</td>
<td>3</td>
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<td>mode of formation of replication fork and its growth, post-replicative</td>
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<td>modification of DNA</td>
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<td>iv. Models of chromosome replication- Cairn’s model and Rolling circle</td>
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<td></td>
<td>model</td>
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<tr>
<td>3</td>
<td>i. Concept of central dogma and its exceptions</td>
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<td></td>
<td>ii. Gene transcription as the 1st step of gene expression, molecular</td>
<td>2</td>
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<td></td>
<td>mechanism of transcription, role of RNA polymerase, initiation,</td>
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<td></td>
<td>elongation and termination of RNA synthesis, post transcriptional</td>
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<td>modifications in bacteria</td>
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<td>iii. Nature of Genetic code - characteristics of genetic code - triplet,</td>
<td>1</td>
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<td></td>
<td>degeneracy, Wobble Hypothesis. Deciphering genetic code, work of</td>
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<td>Nirenburg, Holley and Khorana</td>
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<td>iv. Type of RNAs involved in protein synthesis, structure and function of RNA</td>
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<td>4</td>
<td>i. Gene translation: Ribosome- their general nature, structure and role in protein synthesis</td>
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<td></td>
<td>ii. Initiative, elongation and termination of protein synthesis, post translational processing</td>
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<td>iii. Protein localization- export of protein, role of signal peptides</td>
<td>2</td>
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<td>iv. Regulation of Gene expression:</td>
<td>2</td>
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<td></td>
<td>v. Lac operon (positive &amp; negative control),</td>
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<td></td>
<td>vi. Tryptophan operon (Attenuation control)</td>
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</tr>
</tbody>
</table>

**References:**

1. Microbiology, (5th Ed.) – Prescott
3. Microbiology, (3rd Ed.) - Tortora
4. Genes VIII, -Benjamin Lewin
5. Molecular Genetics of Bacteria (2nd Ed.) - Snyder
GUJJARAT VIDYAPEETH : AHMEDABAD
M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar
Department of Microbiology
Semester-V
(In Force from June-2012)

MIC-501- Introduction to Bacterial Genetics-1
(Syllabus of PRACTICAL portion)
Total Mark: 25= External Evaluation: 20 Marks +
Internal Evaluation: 05Marks)
(Total LAB Hours=45, Credit=02)

1. Isolation of pigmentation mutants of *S. marsencence* by U.V. mutagen
2. Isolation of resistant mutant by gradient plate technique
3. Isolation of DNA from *S. cerevisiae*
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Department of Microbiology  
Semester-V  
(In Force from June-2012)  
MIC-502. Introduction to Bacterial Genetics-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)  

<table>
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<th>Unit</th>
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<tbody>
<tr>
<td>1</td>
<td>Nature of mutation: spontaneous and inducible mutation</td>
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<tr>
<td></td>
<td>i. Phenotypic classes of bacterial Mutants and Genotypic classes of</td>
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<td></td>
<td>bacterial Mutants</td>
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<td>ii. Mutation rate &amp; Mutagenesis(physical, oxidative deaminating agent</td>
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<td>s, base analogues, intercalating agents, alkylating agents, Mu phage)</td>
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<tr>
<td>2</td>
<td>Methods for the isolation of auxotrophic mutants, phenomic and</td>
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<td>phenotypic lag</td>
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<td>i. Reversion of mutation - true reversion and suppression, types of</td>
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<td>suppressor mutations</td>
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<td>ii. DNA repair- direct and indirect repair mechanisms and</td>
<td>3</td>
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<td>recombination repair</td>
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<tr>
<td>3</td>
<td>i. Introduction to genetic recombination and its biological</td>
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<td>significance: Types of recombination and their molecular mechanisms -</td>
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<td>generalized, site specific and illegitimate recombination, recombination frequency and its significance</td>
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<td>ii. Modes of genetic transfer in bacteria- merodiplodic nature of</td>
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<td>bacterial zygote</td>
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<td>iii. Plasmids and transposable elements</td>
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<td>4</td>
<td>i. Transformation: transformation principle, competence factor,</td>
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<td>mechanisms of DNA uptake, transfection</td>
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<td>ii. Transduction: phages involved in, types- restricted, generalized</td>
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<td>and abortive transduction</td>
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<td>iii. Conjugation: role of sex factor, types of crosses involved, F+</td>
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<td></td>
<td>and Hfr cells. Mechanisms of chromosomal transfer interrupted mating</td>
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<tr>
<td></td>
<td>and its applications, Zygotic induction, sex-duction</td>
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</tbody>
</table>

References:  
1. Microbiology, (5th Ed.) – Prescott  
3. Microbiology, (3rd Ed.) - Tortora  
4. Genes VIII, -Benjamin Lewin  
5. Molecular Genetics of Bacteria (2nd Ed.) - Snyder  
1 Study of spontaneous nature of bacterial mutations using Replica plate technique
UNIT : 1. MODES OF ENERGY GENERATION (1) (08 HOURS)
1. The laws of thermodynamics (01 lecture)
2. Free energy change, standered free energy change, Exothermic and Endothermic reactions (01 lecture)
3. High energy compounds, their types and role in metabolism (01 lecture)
4. Modes of ATP production (06 lectures)
   A. Substrate level phosphorylation (01 lecture)
   B. Electron transport chain: In chemotrophs and phototrophs (01 lecture)

UNIT : 2 MODES OF ENERGY GENERATION (02) (07 HOURS)
a. Components of Electron transport chain, their arrangements and their Role in generation of PMF, Chemiosmosis ATPoPhosphohydrolase,Inhibitors and uncouplers, Anaerobicrespiration. (03 lectures)
b. Fermentation (01 lecture)
c. Aerobic Respiration (01 lecture)
d. Photosynthesis. (02 lectures)

UNIT : 3. CHEMOHETEROTROPHIC, CHEMOAUTOTROPHIC AND PHOTOTROPHIC METABOLISM (A) (10 HOURS)
A. Utilizable substrates: Carbohydrates, Lipids, Aeromatic Hydrocarbons and Proteins, Role of reducing power and Precursor Metabolites (04 lectures)
B. Catabolism of Glucose: Glycolysis, ED Pathway, PentosePhosphate Pathway, Fate of Pyruvate under aerobic as well as anaerobic conditions. (06 lectures)
C. Aeromatic Hydrocarbons Catabolism (01 lecture)

UNIT : 4. CHEMOHETEROTROPHIC, CHEMOAUTOTROPHIC AND PHOTOTROPHIC METABOLISM (B) (05 HOURS)
A. Beta oxidation of fattyacids (01 lecture)
B. Catabolism of Proteins and Aminoacids: Deamination, Decarboxylation, Transamination and Decomposition, Stickland reactions (02 lectures)
C. TCA Cycle: Catabolic and Anabolic role of TCA Cycle (02 lectures)
D. Glyoxylate bypass and its significance.

REFERENCE BOOKS OF PAPER BACTERIAL METABOLISM-1
1. Estimation of sugar by Cole’s method
2. Estimation of sugar by Nelson’s method
3. Estimation of protein by Folin’s method
UNIT: 1. CHEMOAUTOTROPHIC METABOLISM (07 HOURS)

A. Utilizable substrates: Hydrogen, CO2, Iron, Elemental S and Reduced S compounds, Role of ATP, Reducing Power and Precursor metabolites (03 lectures)

B. General Properties of ecological significance of Nitrifying Bacteria, Hydrogen bacteria, S oxidizing bacteria and carboxy bacteria, Role of ETC in nitrifying bacteria (04 lectures)

UNIT: 2. PHOTOOAUTOTROPHIC METABOLISM (08 HOURS)

Phototrophic bacteria

1. Photosynthetic Apparatus in Photosynthetic Eubacteria
2. Photosynthetic pigments and their role in harvesting radiant energy.
3. Role of electron carrier molecules in generation of ATP by Photophosphorylation
4. Comparative Account of Plant and Bacterial Photosynthesis.

UNIT: 3. BIOSYNTHESIS OF BUILDING BLOCKS (08 HOURS)

A. Principles governing Biosynthesis (01 lecture)

B. Biosynthesis of Building Blocks (07 lectures)

1. Role of Precursor metabolites in Biosynthesis of Building blocks
3. Biosynthesis of Carbohydrates from non Carbohydrates substrates
   - Calvin’s Cycle, CO2 pathway and Reductive TCA cycle in Autotrophs
   - Gluconeogenesis in Heterotrophs
4. Role of Anaplerotic Reactions
5. Biosynthesis of Saturated and Unsaturated Fattyacids
UNIT: 4. Biosynthesis of Macromolecules (07 HOURS)  
Biosynthesis of Macromolecules. 
1. Introduction to Polymerization  
   - AminoAcids into Polypeptide  
   - Nucleotides into Polynucleotide  
   - Fattyacids into Lipids  
2. Biosynthesis of Phospholipids  
3. Biosynthesis of Peptidoglycan  
4. Methods of Studying Biosynthesis: Use of Biochemical Mutants, Isotopes, Pulse Labbling and metabolic inhibitors. (07 lectures)  

REFERENCE BOOKS  
5. Principles Of Biochemistry by Cohn and Stumph  
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M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar

Department of Microbiology

Semester-V

(In Force from June-2012)

MIC-504- BACTERIAL METABOLISM—2
(Syllabus of PRACTICAL portion)

Total Mark: 25= External Evaluation: 20 Marks +
Internal Evaluation: 05 Marks)

(Total LAB Hours=45, Credit=02)

1 Qualitative analysis of proteins
2 Qualitative analysis of carbohydrates
3 Separation of amino acid by chromatography technique
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Department of Microbiology

Semester-V

**MIC-505- Genetic Engineering**
(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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<tbody>
<tr>
<td>1</td>
<td>i. Introduction to genetic engineering, gene cloning and its ethical consideration</td>
<td>1</td>
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<tr>
<td></td>
<td>ii. Outlines of rDNA technology and its application</td>
<td></td>
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<td>iii. Gene libraries - DNA sequencing, gene bank; screening gene libraries – nucleic acid hybridization, colony and plaque hybridization, immunological detection, gene probes, complementation of mutants</td>
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<td>2</td>
<td>Tools of genetic engineering/rDNA technology</td>
<td>4</td>
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<td>Enzymes: restriction endonucleases, RNA polymerase, DNA ligase, alkaline phosphatase, polynucleotide kinase, reverse transcriptase</td>
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<td>Cloning vectors- plasmids, bacteriophages, cosmids, Ti, YEP</td>
<td>4</td>
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<td>3</td>
<td>i. Selection of genes based on – function, physical differences, complementary RNA, synthetic nucleotide primers</td>
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<td></td>
<td>ii. Isolating genes for known proteins, unknown gene products, chemical synthesis of genes, PCR, site – directed mutagenesis</td>
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<td>4</td>
<td>Genetic engineering of microorganisms (applications) – production of whole cells, SCP, small biological molecules (GA, citric acid, lactic acid, gluconic acid, glutamic acid, lysine, vitamins), alcohol, antibiotics, high molecular weight compounds (biopolymers, proteins and other products)</td>
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<td>Application in medicine – human proteins, recombinant vaccines, human vaccines</td>
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<td>Agriculture and environment – soil fertility, plant growth enhancement, insecticides, environmental pollution remediation</td>
<td>2</td>
</tr>
</tbody>
</table>

**References:**

2. Molecular Biotechnology – Principles and practices – Channarayappa
4. Molecular Biotechnology - Primrose
1. Conjugation,
2. Transformation
3. Recombination
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Department of Microbiology  
M.D. Gramseva Mahavidyalaya, Sadra, Dist. Gandhinagar  
Semester-V  
(In force from June-2012)

Paper No:-   ENG-501  
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 a Collection of Short stories – Orient Blackswan, 
Edited by V. Sasikumar.  
Lesson :  
(1) A service of love  
(2) The Thief  
(3) My brother, My Brother  
(4) The open Window  
(5) Day’s Wait

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) (Sentence base)  
(2) Tenses (application base) (paragraph)

Unit-4 Comprehension (15%)  
(1) Translation Eng. To Guj. (Paragraph)  
(2) Translation Guj. To Eng. (Sentence)  
(3) Complaint letter

Unit-5 Composition (10%)  
Paragraph writing
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M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar  
Department of Microbiology  
Semester-V  
(In Force from June-2012)  
EC-501- Blood Banking  
(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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<tbody>
<tr>
<td>1</td>
<td>i. Blood cells – general characters of RBC, WBC and platelets; production and maturation; haemoglobin</td>
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<td>ii. Haemostatis – role of blood vessels, role of haemoglobin</td>
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<td>iii. Blood coagulation – factors, intrinsic and extrinsic pathway</td>
<td>2</td>
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<td>2</td>
<td>i. Human blood group systems, principles of immunohematology</td>
<td>4</td>
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<td>ii. Blood collection – preparation for blood collection, criteria for the selection of donor, registration of donor and blood collection procedure</td>
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<tr>
<td>3</td>
<td>i. Transport and storage of blood – organization in storage, changes in stored blood, preparation and use of blood components</td>
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<td>4</td>
<td>i. Significance of quality control in blood bank, specimen collection for blood bank, laboratory preparations in blood bank</td>
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<td>ii. Hemagglutination reactions – ABO grouping (slide and tube test), Rh blood typing (slide and tube test), Antihuman globulin (AHG) or Coombs test, compatibility testing (crossmatching) – major and minor, emergency crossmatching, Transfusion reactions and hemolytic disease of the newborn</td>
<td>5</td>
</tr>
</tbody>
</table>

References:  
2. Medical Laboratory Technology (Vol. I) – K. L. Mukherjee  
3. Medical laboratory Technology – Godkar
GUJARAT VIDYAPEETH : AHMEDABAD  
M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar  
Department of Microbiology  
Semester-V  
(In Force from June-2012)  
EC-502. Starter Culture  
(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
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1 | Lactic Acid Bacteria: Classification and Physiology; Bifidobacteria and Probiotic Action; The Probiotic Potential of Propionibacteria | 8
2 | Industrial Use and Production of Lactic Acid Bacteria; Antimicrobial Components from Lactic Acid Bacteria; Lactic Acid Bacteria as a Tool for Enhancing Food Safety by Removal of Dietary Toxins | 7
3 | Prebiotics and Lactic Acid Bacteria; Lactic Acid Bacteria in Vegetable Fermentations; Lactic Acid Bacteria in Cereal-Based Products | 7
4 | Human Studies on Probiotics; Safety of Novel Probiotic Bacteria; Lactic Acid Bacteria as Animal Probiotics; Lactic Acid Bacteria in Fish and Fish Farming; Future Directions of Research and Product Development of Lactic Acid Bacteria | 8

Reference:  
GUJARAT VIDYAPEETH : AHMEDABAD  
M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar  
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Semester-V  
(In Force from June-2012)  
EC-503. Biodeterioration  
(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>Uni</th>
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<tr>
<td>1</td>
<td>Biodeterioration of paper</td>
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<tr>
<td>2</td>
<td>Biodeterioration of wood</td>
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<td>3</td>
<td>Biodeterioration of textile</td>
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<tr>
<td>4</td>
<td>Biodeterioration of lather</td>
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</tbody>
</table>

References:

1. Microbiology, (5th Ed.) – Prescott  
3. Microbiology, (3rd Ed.) – Tortora