

Vels Institute of Science, Technology and Advanced Studies

Old Pallavaram, Chennai-117

SCHOOL OF LIFE SCIENCES

DEPARTMENT OF MICROBIOLOGY

Program Outcomes

UNDERGRADUATE (B. Sc)

PO1: Graduates will acquire adequate knowledge and leadership skills for a successful career.

PO2: Graduates will be able to analyze and solve biology based problems.

PO3: Graduates will cooperate with each other to solve problems with creative thinking.

PO4: Graduates will acquire practical skills- plan & execute experimental techniques independently as well as to analyse & interpret data.

PO5: Graduates will effectively be able to manage resources & time.

PO6: Graduates will be able to learn independently and develop critical thinking.

PO7: Graduates will accomplish ability to communicate effectively and able to understand ethical responsibility.

PO8: Graduates will get adequate knowledge to use information & communication technology.

PO9: Graduates will carry on to learn and to adapt in a world of constantly evolving technology.

Program Specific Outcomes (PSO) - Microbiology

Students who graduate with a Bachelor of Science in Microbiology will

PSO1: Acquire knowledge on fundamentals of Microbiology

PSO2: Understand details of bacterial, fungal, algal and viral morphology and physiology.

PSO3: Competently be able to cultivate and characterize bacterial and fungal forms.

PSO4: Grasp the fundamental concepts of immunity and the contribution of organs and cells in the development of immune response.

PSO5: Gain insight into the various aspects of microbial genetics.

PSO6: Be proficient on cloning vectors and rDNA technology.

PSO7: Assimilate technical skills on microbial genetics and molecular biology.

PSO8: Realize the application oriented aspects of Microbiology.

PSO9: Understand the concepts and development of microbial diseases in animals & plants.

PSO10: Realize the principles of prevention and treatment of microbial diseases.

Vels Institute of Science, Technology and Advanced Studies
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BOARD OF STUDIES

S. No	Name and Address	Designation
1.	Dr. R. Dinakaran Micheal Dean School of Life Sciences Vels University, Chennai – 600 117.	Chairperson
2.	Dr. A.K.Kathireshan Professor and Head Department of Microbiology School of Life Sciences Vels University, Chennai – 600 117.	Internal Member
3.	Mr. Allen John Henry Assistant Professor Department of Microbiology School of Life Sciences Vels University, Chennai – 600 117.	Internal Member
4.	Mrs. G. Gayathri Assistant Professor Department of Microbiology School of Life Sciences Vels University, Chennai – 600 117.	Internal Member
5.	Dr. M. Elanchezhiyan Professor and Head Department of Microbiology University of Madras Dr. ALM PGIBMS Taramani Campus Chennai – 600 113.	External Member
6.	Dr. Rajkumar Samuel Managing Director HUBERT ENVIRO LABS Ashok Nagar, Chennai.	External Member
7.	Ms. Sanchita Nath Research Scholar Department of Microbiology School of Life Sciences Vels University Chennai – 600 117.	Alumni (M.Sc., Immunology and Microbiology, 2013 – 2015 Batch)

B. Sc.
MICROBIOLOGY

Curriculum and Syllabus
(Based on Choice Based Credit System)
Effective from the Academic year
2015 - 2016

B.Sc., MICROBIOLOGY

CURRICULUM

Total number of Credits: 140

Category	Code	Title of the Course	Hours/Week			Credit
			Lecture	Tutorial	Practical	
SEMESTER-I						
AECC	15LTA001 15LHN001 15LFR001	Language-I (Tamil/Hindi/French)	5	0	0	4
AECC	15LEN001	English I	5	0	0	4
CORE	15BMI001	General Microbiology	6	0	0	4
CORE	15BMI002	Basic Techniques in Microbiology	0	0	4	2
DSE		Discipline Specific Elective – I	6	0	0	4
DSE		Discipline Specific Elective – II	0	0	4	2
		Total	22	0	8	20
Category	Code	Title of the Course	Hours/Week			Credit
			Lecture	Tutorial	Practical	
SEMESTER-II						
AECC	15LTA002 15LHN002 15LFR002	Language-II (Tamil/Hindi/French)	5	0	0	4
AECC	15LEN002	English - II	5	0	0	4
CORE	15BMI003	Microbial Taxonomy, Anatomy & Physiology	5	0	0	4
CORE	15BMI004	Microbial Cytology & Physiology	0	0	4	2
DSE		Discipline Specific Elective – III	5	0	0	4
DSE		Discipline Specific Elective – IV	0	0	4	2
SEC		Skill Enhancement Course - I	2	0	0	2
		Total	22	0	8	22

Category	Code	Title of the Course	Hours/Week			Credit
			Lecture	Tutorial	Practical	
SEMESTER-III						
AECC	15LTA003 15LHN003 15LFR003	Language-III (Tamil/ Hindi/ French)	5	0	0	4
AECC	15LEN003	English - III	5	0	0	4
CORE	15BMI005	Microbial Genetics & Molecular biology	5	0	0	4
CORE	15BMI006	Practicals in Microbial Genetics & Molecular separation	0	0	4	2
DSE		Discipline Specific Elective – III	5	0	0	4
DSE		Discipline Specific Elective – IV	0	0	4	2
GE		Generic Elective - I	2	0	0	2
		Total	22	0	8	22
SEMESTER-IV						
AECC	15LTA004 15LHN004 15LFR004	Language-IV (Tamil/ Hindi/ French)	5	0	0	4
AECC		Environmental Science	2	0	0	2
AECC	15LEN004	English - IV	5	0	0	4
CORE	15BMI007	Immunology	5	0	0	4
CORE	15BMI008	Practicals in Immunology	0	0	3	1
DSE		Discipline Specific Elective – I	5	0	0	4
DSE		Discipline Specific Elective – II	0	0	3	1
GE		Generic Elective - II	2	0	0	2
		Total	24	0	6	22

Category	Code	Title of the Course	Hours/Week			Credit
			Lecture	Tutorial	Practical	
SEMESTER-V						
CORE	15BMI009	Microbes in Soil and Agriculture	5	0	0	4
CORE	15BMI010	Pharmaceutical Microbiology	5	0	0	4
CORE	15BMI011	Aquatic Microbiology, Wastewater Technology and Aeromicrobiology	4	0	0	4
CORE	15BMI012	Food Microbiology	4	0	0	4
CORE	15BMI013	Practical V – Food and Aquatic Microbiology	0	0	4	2
CORE	15BMI014	Practical VI - Soil and Pharmaceutical Microbiology	0	0	4	2
GE		Generic Elective - III	2	0	0	2
SEC		Skill Enhancement Course - II	2	0	0	2
CORE		Group Project			0	4
		Total	22	0	8	28
Category	Code	Title of the Course	Hours/Week			Credit
			Lecture	Tutorial	Practical	
SEMESTER-VI						
CORE	15BMI015	Virology	4	0	0	4
CORE	15BMI016	Bacteriology	4	0	0	4
CORE	15BMI017	Parasitology	4	0	0	4
CORE	15BMI018	Mycology	4	0	0	4
CORE	15BMI019	rDNA Technology and Nanotechnology	4	0	0	4
CORE	15BMI020	Practical VII – Lab in Virology and Bacteriology	0	0	4	2
CORE	15BMI021	Practical VIII - Lab in Mycology and Parasitology	0	0	4	2
GE		Generic Elective - IV	2	0	0	2
		Total	22	0	8	26

List of Discipline Specific Electives (Any 4 Papers)

5 0 0 4

- DSE1: 15BMI101 - Fermentation Technology**
- DSE2: 15BMI102 - Biochemistry**
- DSE3: 15BMI103 - Methods in Biochemistry (Practical)**
- DSE4: 15BMI104 - Bioinstrumentation**
- DSE5: 15BMI105 - Bioinstrumentation (Practical)**
- DSE6: 15BMI106 - Bioinformatics**
- DSE7: 15BMI107 - Bioinformatics (Practical)**
- DSE8: 15BMI108 - Human Biology**
- DSE9: 15BMI109 - Human biology (Practical)**
- DSE10: 15BMI110 - Microbial Biotechnology**
- DSE11: 15BMI111 - Environmental Biotechnology**
- DSE 12: 15BMI112 - Methods in Environmental Biotechnology**
- DSE13: 15BMI113 - Biostatistics**
- DSE14: 15BMI114 - Microbial Metabolites**
- DSE15: 15BMI115 - Marine Microbiology**
- DSE16: 15BMI116 – Biofertilizers**
- DSE17: 15BMI117- Methods in Biofertilizers**
- DSE18: 15BMI118 – Immunotechnology**

List of Generic Electives (Any 4 papers)

2 0 0 2

- GE 1: 15BMI151 - Introduction and Scope of Microbiology**
- GE 2: 15BMI152 - Bacteriology and Virology**
- GE 3: 15BMI153 - Microbial Metabolism**
- GE 4: 15BMI154 - Industrial and Food Microbiology**
- GE 5: 15BMI155 - Microbes in Environment**
- GE 6: 15BMI156 - Medical Microbiology and Immunology**
- GE 7: 15BMI157 - Genetic Engineering and Biotechnology**
- GE 8: 15BMI158 - Microbial Genetics and Molecular Biology**

List of Skill Enhancement Courses

2 0 0 2

SEC1: 15BPD251 - Personality Development I

SEC2: 15NSS255 - National Service Scheme I

SEC3: 15NSS256 - National Service Scheme II

SEC4: 15NSS257 - National Service Scheme III

SEC5: 15NSS258 - National Service Scheme IV

SEC6: 15NSS259 - National Service Scheme V

SEC7: 15NSS260 - National Service Scheme VI

List of Ability Enhancement Compulsory Courses

5 0 0 4

AECC 1: 15LTA001 - தமிழ் மொழி, இலக்கிய வரலாறு – அறிமுகம்

15LHN001 - HINDI I

15LFR001 - FRENCH I

15LEN001- ENGLISH I

AECC 2: 15LTA002 - தமிழிலக்கியம்

15LHN002 - HINDI II

15LFR002- FRENCH II

15LEN002 –ENGLISH II

AECC 3: 15LTA003 - பயன்பாட்டுத் தமிழ்

15LHN003 - HINDI III

15LFR003 - FRENCH III

15LEN003- ENGLISH III

AECC 4: 15LTA004 - தமிழர் நாகரிகமும் பண்பாடும்

15LHN004 - HINDI IV

15LFR004 - FRENCH IV

15LEN004-ENGLISH IV

AECC 5: 15ENS201 - Environmental Science

UNIT IV ANTIBIOTICS

14

Antibiotics – Classification, Mode of Action, mechanism of resistance, Evaluation – Disc Diffusion; MIC – Broth dilution, agar dilution; MBC; E- test with Quality control for each method.

UNIT V MICROBIAL GROWTH

20

Growth requirements of Bacteria. Microbial culture media and pure culture techniques. Anaerobic cultivation methods. Preservation of cultures. Quantitation of microbial growth and bacterial growth curve in batch culture. Structure of *Paramecium*, *Amoeba*, *Euglena*, *Giardia*.

Total: 90hours

TEXTBOOKS:

Michael J. Pelczar, E.C.S.Chan, Noel R. Krieg; Microbiology, Tata- McGraw Hill. Ed. 5; 2006.

REFERENCE BOOKS:

1. Ananthanarayanan R & C.K.Jeyaram Paniker; Textbook of Microbiology;Orient Longman. Ed.7; 2005.
2. Michael T. Madigan, John M Martinko; Brock's Biology of Microorganisms, Pearson-Prentice Hall. Ed. 11; 2006
3. Ronald M.Atlas; Principles of Microbiology, WCB Publishers. Ed. 2; 1997
4. Roger Y. Stanier, John L. Ingraham, Mark L. Wheelis,Page R. Painter, Generall Microbiology, MacMillan Press. Ed. 5; 2004.
5. Topley & Wilson's: Principles of Bacteriology, Virology & Immunology,Edward Arnold. Ed. 9; 2002.
6. Lansing M. Prescott, John P Harley, Donald A. Klein; Microbiology, McGraw Hill. Ed. 6; 2005.

Course Course Objectives: The candidate will gain hands-on knowledge and acquire adequate skill required to sterilize media and to prepare, inoculate observe and distinguish the growth patterns in different media.

Course Outcome

At the end of the course, learners will be able to:

CO1: Perform cleaning & sterilization of glasswares

CO2: Competently prepare and cultivate bacteria in different types of media.

CO3: Gain knowledge on filter sterilization techniques

CO4: Know how to grow algae in the lab

CO5: Competently able to identify sensitivity and resistance of bacteria

1. Cleaning of Glassware.
2. Sterilization of Glassware.
3. Preparation and growth of Bacteria in Basal Media – Nutrient Broth.
4. Preparation and growth of Bacteria in Basal Media – Peptone Water.
5. Preparation and growth of Bacteria in Basal Media – Nutrient Agar.
6. Preparation and growth of Bacteria in Differential Media – MacConkey Agar.
7. Preparation and growth of Bacteria in Selective Media – Cetrimide Agar.
8. Preparation and growth of Bacteria in Carbohydrate Fermentation Media.
9. Filter sterilization of Serum.
10. Cultivation of Algae.
11. Identification of *Spirogyra*, *Chlamydomonas*, *Anabaena* and *Nostoc*.
12. Antibiotic sensitivity test – Kirby Bauer Method.

Total: 60hours

UNIT IV LIFE CYCLE AND REPRODUCTION 15

Structure of algal cell with example; Life-cycle patterns of Algae. Reproduction in algae. Structure of Fungi - unicellular and multicellular forms. Structure of Virus – Adenovirus, Retrovirus, TMV and T- phage.

UNIT V PHOTOSYNTHESIS IN BACTERIA 15

Photosynthesis in Bacteria – Oxygenic and Anoxygenic. Nitrogen Fixation. Glycolysis, HMP, TCA, ED pathways, Glyoxylate cycle. Respiration – Aerobic and Anaerobic. ATP synthesis.

Total: 75hours

TEXTBOOK:

Roger Y. Stanier, John L. Ingraham, Mark L. Wheelis, Page R. Painter; General Microbiology, MacMillan Press. Ed. 5; 2004.

REFERENCE BOOKS:

1. Ananthanarayanan R & C.K. Jeyaram Paniker, Textbook of Microbiology, Orient Longman. Ed. 7; 2005.
2. Michael T. Madigan, John M Martinko,; Brock's Biology of Microorganisms, Pearson-Prentice Hall. Ed. 11; 2006.
3. Ronald M. Atlas,; Principles of Microbiology, WCB Publishers. Ed. 2; 1997.
4. Topley & Wilson's : Principles of Bacteriology, Virology & Immunology,; Edward Arnold. Ed. 9; 2002.
5. Lansing M. Prescott, John P Harley, Donald A. Klein; Microbiology,; Mc Graw Hill. Ed. 6; 2005.

Course Objective: The candidate will gain hands-on knowledge and acquire adequate skill required to stain observe and identify the structure, shape and arrangement of bacteria in samples. Categorization of organisms based on their growth characteristics and outcome of growth will be documented.

Course Outcome

At the end of the course, learners will be able to:

CO1: Understand the concept of different staining methods

CO2: Know how to study different morphological forms of microbes

CO3: Gain insights into identification methods of bacteria based on biochemical properties

1. Simple staining of Bacteria. Gram's staining.
2. Acid-Fast staining.
3. Staining for Metachromatic granules.
4. Observation of various Microorganisms in Hay Infusion Broth.
5. Catalase Test. Oxidase Test.
6. OF Test.
7. Test for H₂S Production.
8. Nitrate Reduction Test.
9. IMViC Test.
10. Test for production of Amylase.
11. Test for production of Protease.
12. Micrometry.

Total: 60hours

Course Objectives: The candidate will gain knowledge about the structure, shape and significance of DNA, RNA. Synthesis of RNA and proteins along with its control. Role of genes as basic units of expression.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Understand the flow of information from DNA to Protein.
- CO2:** Know in detail the structure of DNA & RNA as well as their physical & chemical properties.
- CO3:** Gain insights into the various processes involved in the replication of DNA.
- CO4:** Grasp the replication of single-stranded DNA molecules and the various features of retrovirus replication.
- CO5:** Assimilate knowledge regarding various natural and artificial means by which DNA may be altered and the repair mechanisms in the eventuality of damage.
- CO6:** Study the various aspects of integration of extraneous DNA into host chromosome.
- CO7:** Get a complete understanding of the process of formation of RNA from DNA in both prokaryotes & eukaryotes.
- CO8:** Appreciate the various cellular mechanisms involved in the control of transcription.
- CO9:** Firm grasp of the process of protein synthesis with post-synthetic modifications.
- CO10:** Basic understanding of control methods for gene expression.
- CO11:** Understanding the language for communication in cells.
- CO12:** Basic knowledge about gene transfer mechanisms prevalent in bacteria.
- CO13:** Rudimentary knowledge about plasmids and transposons especially as cloning vectors.
- CO14:** Molecular basis of heritable changes in cells along with insights about evolutionary methods to overcome change.
- CO15:** Firm grasp of *E.coli* gene mapping methods as well as those of yeast

UNIT I NUCLEIC ACIDS

16

Nucleic acids as genetic material – DNA and RNA structure. Properties of nucleic acids. DNA replication – general principles, modes of replication, Mechanism. Superhelicity in DNA, topology and topoisomerases.

15BMI005 Microbial Genetics and Molecular Separation (Practical) 0 0 4 2

Course Objectives: The candidate will gain hands-on knowledge and acquire adequate skill required to separate and observe chromosomal DNA, RNA, amino acids, lipids as well as estimate nucleic acids.

Course Outcome

At the end of the course, learners will be able to:

CO1: Understand the concept of plasmid isolation and characterization

CO2: Know how to purify bacterial chromosomal DNA

CO3: Gain knowledge on methods of DNA & RNA estimation

CO4: Acquire technical knowledge on paper & thin layer chromatography

1. Isolation of plasmid DNA and its demonstration by agarose gel electrophoresis.
2. Isolation of bacterial chromosomal DNA and demonstration.
3. Estimation of DNA by chemical method.
4. Estimation of DNA by spectroscopy.
5. Estimation of RNA by chemical method.
6. Separation of amino acids by paper chromatography.
7. Separation of lipids by TLC.

Total: 60hours

Course Objectives: The candidate will gain knowledge about immunity, organs of immunity and cells involved. Types of antigens and immunoglobulins. Antigen- antibody reactions and assays. MHC and its significance.

Course Outcome

At the end of the course, learners will be able to:

- CO1: Understand the fundamental concepts of immunity, contributions of the organs and cells in immune responses.
- CO2: Understand the antigens & their characters
- CO3: Understand the different types antibodies & their properties
- CO4: Understand the mechanisms involved in antigen-antibody reactions
- CO5: Differentiate the humoral and cell mediated immune mechanisms
- CO6: Comprehend the overreaction by our immune system leading to hypersensitive conditions and its consequences
- CO7: Know how MHC functions in the immune system
- CO8: Gain knowledge on vaccines, toxoids and immunotherapy

UNIT I IMMUNITY 15

Introduction- immunity- types-innate, acquired. Cell mediated immunity and Humoral immunity. Ontogeny and Physiology of immune system- Primary and Secondary lymphoid organs, lymphoid tissues. Immunoreactive cells- structure and functions-macrophages, granulocytes, NK cells, T and B lymphocytes. Phagocytosis.

UNIT II ANTIGENS AND IMMUNOGLOBULINS 15

Antigens and immunogenicity- terminologies and definition- antigen, immunogen, haptens, adjuvant, super antigen, tolerance, epitope, paratope. Features associated with antigenicity and immunogenicity. Immunoglobulin- structure, types, distribution, biological and chemical properties. Theories of antibody production- its regulation and diversity. Monoclonal and polyclonal antibodies.

UNIT III ANTIGEN-ANTIBODY REACTIONS 15

Antigen-antibody interactions- Primary interactions, *in vitro* reactions-precipitation, agglutination reactions, labeled assays – ELISA, RIA, IFT-*in vivo* reactions- skin tests, immune complex demonstration. Complement system – mode of activation- Classical, Alternate and Lectin pathways, biological functions. CFT.

UNIT IV IMMUNE CELLS**15**

Ontogeny of B cell lymphocytes, B-cell receptors; Thymic selection of T-cells; Activation and function of T and B cells. Cytokines – General properties, functional categories.

UNIT V MHC, HYPERSENSITIVITY AND VACCINES**15**

MHC – structure of MHC I and MHC II, Role of MHC in antigen processing and presentation. Hypersensitivity – types and mechanisms. Vaccines- types, Toxoids- bacterial and viral. Passive immunization, Immunotherapy- functions and applications of antibodies, Development of antibodies in animals and plants. Current understanding of possible vaccine development and therapeutic agents.

Total: 75hours**TEXTBOOK:**

Richard Coico, Geoffrey Sunshine, Eli Benjamini. Immunology – A Short Course. Wiley-Liss, New York. 5th ed., 2003.

REFERENCE BOOKS:

1. Ivan M. Roitt, J. Brostoff and D. K. Male, Immunology, Gower Medical Publishing, London.1993.
2. Clark WR, The experimental foundations of modern immunology. John Wiley and Sons Inc. New York. 1991.
3. Janis Kuby, Immunology, II edition. W. H. Freeman and Company, New York. 1993.
4. Janeway Travers, Immunobiology- the immune system in health and disease. Current Biology Ltd. London, New York. 3rd ed.,1997.
5. Peter J. Delves, Ivan M. Roitt, Encyclopedia of Immunology; Academic Press. 2nd Ed., 1998.
6. Chapel H and Halbey M, Essentials of Clinical Immunology. ELBS. 1986.
7. Leslie Hudson and Frank C. Hay. Practical Immunology. Blackwell Scientific Publication. 3rd ed., 1989.
8. Pravash Sen. Gupta, Clinical Immunology. Oxford University Press. 2003.
9. Noel R. Rose, Herman Friedman, John L. Fahey. Manual of Clinical Laboratory Immunology. ASM. 3rd ed., 1986.

Course Objectives: The candidate will gain hands-on knowledge and acquire adequate skill required to identify lymphocytes, various agglutination and precipitation reactions. Perform and interpret ELISA tests and Immuno-electrophoresis as well as purify immunoglobulins.

Course Outcome

The students will be able to

CO1: Identify various immune cells and enumerate them

CO2: Competently perform serological diagnostic tests such as RF, ASO, CRP.

CO3: Identify blood groups and types

CO4: Diagnose syphilis by performing TPHA test

CO5: Analyze and quantify the antigens / Abs by performing immunoelectrophoresis, chromatography techniques

CO6: Understanding the concept of ELISA

1. Identification of various immune cells by morphology.
2. Latex Agglutination reactions- RF, ASO, CRP.
3. Hemagglutination Reactions- Blood Grouping, Rh Typing, TPHA.
4. Precipitation reactions in gels – SRID, ODD.
5. Immuno-electrophoresis and staining of precipitation lines.
6. ELISA for HBs antigen detection.
7. Preparation of lymphocytes from peripheral blood by density gradient centrifugation.
8. Purification of immunoglobulin - Ammonium sulphate precipitation.
9. Separation of IgG by chromatography.
10. Titration of Amboceptor.

Total: 60hours

Course Objectives: The candidate will gain knowledge about the role of microbes in soil, especially, rhizosphere, phyllosphere. Nutrient cycling with emphasis on role of various groups of microorganisms at different stages of various cycles. Nitrogen fixation - Biofertilisers, biopesticides and plant pathology.

Course Outcome

At the end of the course, learners will be able to:

CO1: Gain knowledge about the role and importance of soil microbes.

CO2: Learn about the impact of the soil microbes for plants growth.

CO3: Acquire knowledge on the symbiotic, free living association of nitrogen fixation.

CO4: Learn importance and the need of nitrogen fixation process by microbes.

CO5: Become skilled in mass production and applications of biofertilizer

CO6: Gain knowledge of bacterial, fungal and viral biopesticides.

CO7: Attain knowledge in plants and microbial interactions

CO8: Learn the disease management in crops.

CO9: Achieve information and importance of biogeochemical cycles in environment.

UNIT I INTRODUCTION

13

Historical development of soil microbiology, various types of soil microbes and their importance. Organic matter – sources and decomposition. Soil enzymes and soil sickness

UNIT II PLANT MICROBES INTERACTION

17

Plant microbes interaction – rhizosphere, phyllosphere, root nodules (*Rhizobium*, *Frankia*), stem nodules, mycorrhiza, PGPR etc. Nitrogen fixation – symbiotic (*Rhizobium*, *Azolla*, *Anabena*) free living (*Azotobacter*, BGA) and associative (*Azospirillum*) phosphate solubilization.

UNIT III BIOFERTILIZER AND BIOPESTICIDE

15

Preparation, application and advantage of Biofertilizer – Nitrogen fixer – *Rhizobium*, *Azotobacter*, *Azospirillum*, *Azolla-Anabena*, *Nostoc*, Phosphate solubilising – phosphobacterium and mycorrhizal biofertilizer. Biopesticide- Bacterial, fungal and viral.

UNIT IV PLANT DISEASES**17**

Plant pathology – Host and pathogen interaction. Transmission of plant pathogen. Various symptoms of plant diseases. A brief account of symptoms, etiology, life cycles and management of microbial diseases to crop plants (Rice, sugarcane, groundnut, Tomato, potato, wheat, banana, grapes and pulses)

UNIT V BIOGEOCHEMICAL CYCLES**13**

Biogeochemical cycles. Importance of biogeochemical cycle in environment. A brief account of carbon cycle, sulphur cycle, phosphorus cycle, nitrogen cycle and iron cycle.

Total: 75hours**TEXTBOOKS:**

1. Vijaya Ramesh ;Soil and Agricultural Microbiology, MJP Publishers; 2004.
2. P. D. Sharma, Environmental Microbiology, Narosa Publications Limited. 2005.

REFERENCE BOOKS:

1. Subba Rao N.S.; Soil Microorganisms and Plant Growth, Oxford and IBH publication Co. Pvt. Ltd. New Delhi. 2002.
2. Cambell. R., Microbial Ecology., Blackwell Scientific Publication. London. 2nd edition, 1983.
3. Mitchell.R.; Introduction to Environmental Microbiology, Prentice – Hall. Inc. Cliffs - New Jersey. 2003.
4. N.S.Subba Rao. Soil Microbiology and Biochemistry. Oxford and IBH Publication Pvt. Ltd. 1998.
5. N.S. Subba Rao, Biofertilizer in Agriculture and Forestry, Oxford and IBH publication. 3rd edn, 2005.
6. Lynch , J.M. and Poole, Microbial Ecology. A Concept Approach, BI scientific publication London. 2005.
7. Rheinheimer, Aquatic Microbiology. John Wiley and sons, Chichester. 2nd edn. 2008.
8. Ronald. M. Atlas, Richard Bartha, Microbial Ecology. Fundamental and application, An imprint of Addison Wesley Longman Inc. 4th ed, 1998.
9. Joseph. C. Daniel, Environmental Aspects of Microbiology, Brightsun Publications. 1st ed, 2006.
10. Ec Edowrly.S, Hardman OJ and Wait S, Pollution: Ecology and Biotreatment, Longman Scientific Technical. 1993.
11. Baker KH and Herson OS, Bioremediation, Mc Graw Hill, NY. 1994.

Course Objectives: The candidate will gain knowledge about role of microbes in pharmaceutical industry, role of disinfectants, sterilization in pharmaceutical formulations, antimicrobial agents and vaccine production.

Course Outcome

At the end of the course, learners will be able to:

CO1: Understand the sources of different types of micro-organisms that are related to pharmaceutical operations and GMPs regulations

CO2: Learn the various types of disinfectant and policy in pharmaceutical industry.

CO3: Understand the pharmacopoeial standards of sterilization process.

CO4: Learn the role of beta lactam antibiotics and non beta lactam antibiotics in pharmaceutical industry.

CO5: Understand the vaccines and Production of pharmaceuticals by microbes.

UNIT I INTRODUCTION 17

Ecology of microorganisms and pharmaceutical products – air, water, raw materials, packaging, buildings, equipments, cleaning equipment and utensils. Microbial spoilage – factors, source and control, extent, medicament – borne infection, preservation and quality assurance.

UNIT II DISINFECTANTS 13

Factors in choice of antimicrobial agent, types of disinfectants, disinfectant policies. Mechanism of action of antimicrobial chemical disinfectants, sensitivity and resistance.

UNIT III STERILIZATION 13

Sterilization procedures- Heat, gaseous, radiation, filtration, new sterilization methods. Sterility testing methods – specific inactivation, dilution, and membrane filtration.

UNIT IV ANTIMICROBIAL AGENTS_

17

Antimicrobial agents: Types of antibiotics, Synthetic microbial agents - mechanism of action and its clinical uses. Evaluation of liquid disinfectants- Phenol coefficient tests, capacity use dilution test. Disinfectant efficacy tests. Production of Penicillin, Streptomycin.

UNIT V VACCINES

15

Production of vaccines, *in – vivo* diagnostics, immune sera and human immunoglobulins with quality control. Production of pharmaceuticals by microbes – Dextran, vitamins, human insulin.

Total: 75 hours

TEXT BOOK:

Ronald. M. Atlas, Richard Bartha, Microbial Ecology. Fundamental and application, An imprint of Addison Wesley Longman Inc. 4th ed, 1998.

REFERENCE BOOKS:

1. Russell and Ayliffe, G.A.J Principles and practice of Disinfection, preservation and sterilization; Oxford Univeresity Press. 1982.
2. Gregory P.H.; Microbiology of the Atmosphere; Leonard Hill. 2nd ed., 2000.
3. Murray. S. Cooper, Quality Control in Pharmaceutical Industry, Vol 2; Academic press, New York. 2001.
4. S.P.Vyas, V.K. Dixit, Pharmaceutical Biotechnology; CBS publishers and Distributors, New Delhi. 2004.
5. Rajesh Bhatia, Ratanlal Ihhpunjani, Quality assurance in Microbiology; CBS publishers and distributors, New Delhi. 2005.

15BMI011 Aquatic Microbiology, Wastewater Technology and Aeromicrobiology

4 0 0 4

Course Objectives: The candidate will gain knowledge about microbes in air, air sanitation and quality assessment. Types of water ecosystems and water-borne diseases. Effluent treatment and parameters – BOD, COD. Extremophiles in the environment.

Course Outcome

At the end of the course, learners will be able to:

CO1: Gain knowledge on the role and infections caused by microbes in air.

CO2: Obtain detailed information on aquatic ecosystems.

CO3: Assimilate knowledge on Water borne diseases.

CO4: Get detailed knowledge on Waste water treatment and its different methods.

CO5: Basic understanding on different types of microbes present in the environment and its uses.

CO6: Acquire knowledge on Biodegradation, of xenobiotic compounds.

CO7: Understanding of Biomagnification and Bioremediation.

UNIT I INTRODUCTION 11

Microbiology of air; droplet, droplet nuclei, aerosol, infectious dust. Assessment of air quality. Laboratory hazards of air microbes, air borne diseases, air sanitation. Aero mycology.

UNIT II AQUATIC MICROBIOLOGY 13

Aquatic Microbiology- aquatic ecosystems- fresh water (ponds, lakes, streams), marine ecosystem (estuaries, mangroves, deep sea, salt pan, coral reef); eutrophication. Potability of water, assessment of water quality, purification of drinking water. Water borne diseases- pathogenesis, prevention and control.

UNIT III WASTE WATER MICROBIOLOGY 12

Waste water Microbiology- types and characteristics of waste, BOD, COD. Liquid waste treatment- primary, secondary, tertiary treatment, disinfection and disposal, Solid waste treatment- composting, saccharification and gasification, pyrolysis, incineration.

UNIT IV MICROBES IN ECOSYSTEM 12

Microbial communities and role of microbes in ecosystem (primary producer and decomposer). Adaptations of microbes in extreme environment- thermophile, psychrophile, halophile, acidophile, alkalophile, barophile, osmophile.

Recalcitrance and biodegradation of recalcitrant compounds. Biodegradation of xenobiotic compounds. Bioaccumulation of heavy metals, biomagnification, biocorrosion, bioleaching and biomining. Bioremediation.

Total: 60hours

TEXTBOOK:

Ronald. M. Atlas, Richard Bartha, Microbial Ecology. Fundamental and application, An imprint of Addison Wesley Longman Inc. 4th ed, 1998.

REFERENCE BOOKS:

1. Joseph. C. Daniel, Environmental Aspects of Microbiology, Brightsun Publications. 2nd. Ed., 2006.
2. Dr. K. Vijaya Ramesh, Environmental Microbiology, MJP Publishers. 1st Ed, 2004.
3. A. J. Salle, Fundamental Principles of Bacteriology, Tata McGraw Hill Publishing Company. 7th Ed, 1990
4. Paul Singleton, Diana Sainsbury, Dictionary of Microbiology and Molecular Biology, John Wiley and Sons. 2nd ed, 1997.
5. P. D. Sharma, Environmental Microbiology, Narosa Publications Limited. 1st Ed, 2005.
6. Edowrly.S, Hardman OJ and Wait S, Pollution: Ecology and Biotreatment, Longman Scientific Technical. 1993.
7. Baker KH and Herson OS, Bioremediation, Mc Graw Hill, NY. 1994.
8. R. C. Dubey and D. K. Maheswari, Practical Microbiology, S, Chand & Co Ltd, New Delhi. 1st ed, 2008.

Course Objectives: The candidate will gain knowledge about food preservation, spoilage. Sanitation requirements and in-plant mechanism with documentation – GMP, HACCP. Dairy microbiology – cheese, Yogurt. Food-borne diseases and its control.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Understand the role of microbes in foods
- CO2:** Appreciate the beneficial effects of microbes in foods
- CO3:** Comprehend the factors influencing microbial growth and survival in foods
- CO4:** Know the principles and various methods of food preservation
- CO5:** Know the spoilage organisms in different types of foods
- CO6:** Realize the importance of food sanitation and appreciate the practice of GMPs, HACCP and quality systems like BS 5750, ISO 9000 series etc.
- CO7:** Learn the microbiology of milk and other dairy products and microbes involved in dairy and non-dairy food fermentations
- CO8:** Understand the significance of food borne diseases in association with public health and learn the methods of control of such infections.

UNIT I INTRODUCTION 12

Scope of food microbiology. Microorganisms important in food microbiology- molds, yeasts and bacteria. Factors influencing microbial growth and survival in foods – intrinsic and extrinsic factors. Common spoilage organisms in food.

UNIT II FOOD PRESERVATION METHODS 12

Principles of food preservation – Asepsis, Removal of microbes, maintenance of anaerobic conditions. Methods – physical- heat-processing, canning process, low temperature- chilling, freezing, high pressure, controlled and modified atmosphere, drying, irradiation. Chemical methods- use of preservatives, food additives.

UNIT III MICROBIAL SPOILAGE AND CONTROL 12

Spoilage of foods – Meat, Eggs, Sea foods, Fruits, Vegetables and Grains. Food Sanitation- Controlling microbiological quality of foods- sampling schemes, control at source, GMPs, HACCP, Personal Hygiene. Quality Systems – BS 5750, ISO 9000 series.

UNIT IV MICROBIOLOGY OF MILK AND DAIRY PRODUCTS 12

Microbiology of milk and dairy products- contamination, spoilage and preservation of dairy products. Fermented dairy products – cheese and its types, butter, yoghurt, butter milk, acidophilus milk, kefir, koumiss. Microbes as food. Non-dairy products – Bread, wine, fermented vegetables and vinegar.

UNIT V FOOD-BORNE DISEASES 12

Food microbiology and public health. Food hazards, Significance of food-borne diseases, Incidence and Risk factors. Bacterial and non-bacterial food borne infections and intoxications. Methods of microbiological examination of foods- indicator organisms, direct examination, cultural techniques. Packing of foods.

Total: 60hours

TEXTBOOKS:

Adams MR and Moss MO, Food Microbiology. New Age International Publishers. 2005.

REFERENCE BOOKS:

1. Frazier WC and Westhoff DC, Food Microbiology. Tata McGraw Hill Publishing Company Limited. New Delhi. 1988.
2. Sivasankar, B. Food Processing and Preservation, Prentice Hall of India Pvt. Ltd. 2002.
3. James M. Jay, Modern Food Microbiology, CBS Publishers and Distributors. New Delhi. 1996.
4. Board, RC. A Modern Introduction to Food Microbiology. Blackwell Scientific Publications, Oxford. 1983.
5. Ananthkrishnan CP, Singh RB, Padmanabhan PN, Dairy Microbiology, Sri Lakshmi Publications, Chennai. 1994.
6. Robinson RK. Dairy Microbiology, Wiley and Sons. New York. 2002.
7. Salle, A.J. Fundamental Principles of Bacteriology. Tata McGraw Hill Publishing Company Ltd. 7th Ed., 2001.
8. Samuel C. Prescott, Cecil G. Dunn. Industrial Microbiology, Agro Bios India. 2005.
9. Michael P. Doyle, Larry R. Beuchat, Thomas J. Montville. Food Microbiology- Fundamentals and Frontiers. ASM Press. 2nd Edition. 2001.

Course Objectives: The candidate will gain hands-on knowledge and acquire adequate skill required to evaluate the quality of milk, curd and spoilage organisms. Microbiological evaluation of water and air will be practiced.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Analyse the microbiological quality of raw milk by MBR test
- CO2:** Evaluate the microbiological quality of curd by Standard Plate Count
- CO3:** Examine and enumerate the bacteria in spoiled foods
- CO4:** Produce wine of good quality using beneficial microbes
- CO5:** Analyze the potability of water

1. Dye Reduction Tests for milk – MBRT test.
2. Evaluation of quality of curd by SPC.
3. Enumeration of bacteria in spoiled foods.
4. Production of Wine
5. Enumeration of microbes in air- settle plate method, air sampling methods.
6. Physical, chemical and microbial assessment of water- color, pH, alkalinity, acidity, BOD, COD, anions, cations.
7. MPN for water.
8. Enumeration of microbes using membrane filter.
9. Isolation of faecal coliform from water.
10. Field trip to sewage treatment plants, coastal area, salt pans, coral reef.

Total: 60hours

Course Objectives: The candidate will gain hands-on knowledge and acquire adequate skill required to isolate actinomycetes, nitrogen fixing *Rhizobium*, and *Xanthomonas*. Quality control of sterilization and pharmaceuticals will be taught.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Analyse the soil to isolate Actinomycetes
- CO2:** Know how to study Rhizobium from root nodules
- CO3:** Assimilate knowledge on effect of Rhizobium on seeds
- CO4:** Understand quality checking of pharma products

1. Isolation of Actinomycetes from soil
2. Isolation and study of Rhizobium.
3. Isolation of plant pathogens –Xanthomonas.
4. Seed inoculation with- Rhizobium.
5. Root nodule staining of legumes.
6. Microbial analysis of ophthalmic solution.
7. Sterility testing methods for pharmaceutical products.
8. Quality Testing for sterilization equipment.

Total: 60hours

GROUP PROJECT

The group project to be carried out by the students in the fifth semester is included to expose them to learn and experience through performing tasks. It enables students in developing critical thinking and problem solving skills. The students as a group are required to choose a topic with the help of their project guide. The work has to be planned and designed with aims and objectives to enable proper execution. The students are trained to collect the literature and devise methods to carry out experiments. The results are analyzed and the data are submitted as a Dissertation. Evaluation of the group projects are done based on the student involvement, a record of the work, scholarly contributions, result interpretation and conclusion.

Course Objectives: The candidate will gain knowledge about the classification of viruses, its characteristics and structure. Study of a few viral diseases and its treatment. Bacteriophage life cycles and viral cultivation methods.

Course Outcome

At the end of the course, learners will be able to:

CO1: Acquire basic knowledge on properties of viruses and their detection methods

CO2: Gain knowledge on Viral classifications

CO3: Get complete information on pathogenic viruses

CO4: Obtain informations on antiviral agents & vaccines and bacteriophages

CO5: Assimilate knowledge on cultivation of viruses

CO6: Gain knowledge on different viral diagnostic techniques

UNIT I INTRODUCTION 12

General properties of viruses, Structure of TMV, Adenovirus, Rhabdovirus, Influenzavirus, HIV, HBV, Ebolavirus; Electron Microscopic techniques for detection of virus.

UNIT II CLASSIFICATION 12

Classification of Animal viruses. Classification of plant viruses. Classification of bacteriophages.

UNIT III COMPLETE ANALYSIS OF VARIOUS PATHOGENIC VIRUSES 12

General properties, antigenic structure, pathogenesis, clinical findings, prevention, control and treatment of following viruses HIV, HAV, HBV, Rabies, Influenza, Dengue, Yellow Fever, Adeno, Measles, Mumps, Rubella, Polio, Variolla, Vaccinia, Rota and Oncogenic Virus.

UNIT IV LIFE CYCLES 12

Antiviral agents, chemotherapy and vaccines. Virioids, prions, virusoids and satellite RNA. Bacteriophage –life cycle lytic and lysogeny with control mechanism.

UNIT V CULTIVATION AND DIAGNOSTIC TECHNIQUES

12

Cultivation of virus – Egg inoculation, Cell culture methods, pathogenesis of animal and plant pathogens. Viral diagnosis techniques –Immunological, cytopathic effect,molecular diagnostic methods.

Total: 60hours

TEXTBOOK:

Saravanan.P, Virology, MJP Publishers. 2006.

REFERENCE BOOKS:

1. S.B.Biswas, Amita Biswas, An Introduction To Viruses, Vikas Publishing House. 2003.
2. Douglas D.Richman, Richard j.Whitley, Frederick G.Hayden, Clinical Virology; Churchill-Livingstone. 1997.
3. S.j.Flint, L.W.Enquist, R.M.krug, V.R.Racanielo, A.M.Skalka, Principles of Virology, Molecular Biology, pathogenesis And Control, ASM Press. 2000.
4. Topley & Wilson's Principles of Bacteriology, Virology & Immunity, Vol. 4, 9th Ed.1998.
5. Roger Hull, Matthew's Plant Virology, Academic Press. 2002.
6. Ananthnarayanan. R & C. K. Jeyaram Panicker; TEXTBOOKS of Microbiology, Orient Longman. 2006.
7. Baron EJ, Fine Gold S.M; Diagnostic Microbiology. Blackwell Scientific Systems. 1995.
8. Jawetz. E, Melnick J.L, Adelberg E.A; Review of Medical Microbiology, Lange Medical Publications, ELBS, London. 19th Edn., 1998.

Course Objectives: The candidate will gain knowledge about the normal microflora and virulence factors of bacterial pathogens. Pathogens, pathogenesis, clinical manifestations, lab diagnosis, epidemiology, chemotherapy and prevention of diseases. Collection and processing of specimens for bacteriological analysis.

Course Outcome

At the end of the course, learners will be able to:

CO1: Understand the bacterial virulence factors and mechanisms.

CO2: Gain knowledge on Host-Parasite relationships

CO3: Get complete information on pathogenesis of bacterial diseases

CO4: Comprehend the diagnosis of bacterial infections and prevention methods

CO5: Assimilate knowledge on different mode of transmission of bacterial diseases

CO6: Gain knowledge on community-acquired and nosocomial infections

CO7: Understand mode of action of antibiotics and drug resistance mechanisms

CO8: Learn the methods of collecting clinical specimens and their processing

UNIT I INTRODUCTION 12

Clinical conditions of various syndromes – General and specific syndrome. Normal flora of human body. General attributes and virulence factors of bacteria causing infections – invasiveness and toxigenicity. Host – Parasite relationships – non specific host immune mechanism.

UNIT II PATHOGENESIS, DIAGNOSIS AND PREVENTION 12

Pathogens, pathogenesis, clinical manifestations, lab diagnosis, epidemiology, chemotherapy and prevention of following diseases based on portal of entry: Via respiratory tract – Pneumonia, bronchitis, rheumatic fever, diphtheria, whooping cough, tuberculosis, meningitis. Via gastrointestinal tract – Botulism, gastroenteritis, enterocolitis, typhoid, cholera, bacillary dysentery. Via genitourinary tract – Urinary tract infections, female genital tract infections, gonorrhoea, syphilis, non – gonococcal urethritis.

UNIT III MODE OF TRANSMISSION 12

Via skin – Disease of superficial body tissues: Animal bites, plague, relapsing fever, Typhus – Direct contact: Leprosy, brucellosis, leptospirae, glomerulonephritis – Wounds and Burns:

Course Objectives: The candidate will gain knowledge about the structure of protozoa and helminths; life-cycle patterns, pathogenesis, identification, and treatment.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Understanding of Parasites-Hosts interactions
- CO2:** Know about the taxonomy of parasites
- CO3:** Gain knowledge on diagnosis of parasitic diseases
- CO4:** In-depth knowledge on pathogenicity and life cycle of protozoans
- CO5:** Assimilate various laboratory techniques for diagnosis of medically important protozoans.
- CO6:** Basic and advanced information on pathogenicity, methods of transmission and laboratory techniques of blood flagellates- Malaria, Leishmania.
- CO7:** Gain knowledge on development of diseases in humans by Cestodes & Trematodes.
- CO8:** Grasp the information on pathogenic characters and laboratory diagnosis of Nematodes.
- CO9:** A thorough knowledge on parasitic infections in AIDS patients.

UNIT I INTRODUCTION 12

Introduction to parasitology, Classification, Host – parasite relationship, Lab diagnosis of parasitic infections.

UNIT II PROTOZOOLOGY 12

Protozoology- pathogenic mechanism, transmission, life cycle, lab diagnosis of Protozoans – *Entamoeba*, *Giardia*, *Trichomonas*, *Balantidium*.

UNIT III HAEMOFLAGELLATES 12

Haemoflagellates- *Leishmania*, *Trypanosomes*- *Trypanosoma* and *Sporozoites-Plasmodium*. *Toxoplasma*, *Cryptosporidium*.

UNIT IV HELMINTHES 12

Helminthes – Cestodes – *Taenia solium and saginata, Echinococcus*. Trematodes – *Fasciola hepatica, Fasciolopsis buski, Paragonium, Trematodes- Schistosomes, Trichinella*.

UNIT V NEMATODES 12

Nematodes – *Ascaris, Ancylostoma, Trichuris, Strongyloides, Enterobius, Filarial worms- Wuchereria, Brugia, Loa Loa, Dracunculus, Onchocerca*; and other parasitic infections in immunocompromised hosts and AIDS associated parasites.

Total: 60hours

TEXTBOOK:

Chatterjee; Medical Parasitology. CBS Publishers. 2008.

REFERENCE BOOKS:

1. D.R. Arora & B.R. Arora Medical Parasitology, CBS Publishers & Distributors, New Delhi. 1st Edn., 2002.
2. Subhas Chandra Parija, Medical Parasitology, 2nd Edn., 2009.
3. Jayaram Panicker, TEXTBOOKS of Parasitology, C.K. Jaypee Brothers, New Delhi. 2006.
4. Gerald D. Schmidt & Larry S. Roberts. Foundations of Parasitology, 6th Edn., 2008.
5. S.L. Fleck., A. H. Moody. Diagnostic Techniques in Medical Parasitology, ELBS. 1st Edn., 1999.

Course Objectives: The candidate will gain knowledge about the structure of fungi, life-cycle patterns, pathogenesis, identification, and treatment of fungal infections.

Course Outcome

At the end of the course, learners will be able to:

CO1: Basic understanding of Fungi- their structure & methods of reproduction.

CO2: Grasp the information on growth requirements & culture methods of fungi.

CO3: Gain knowledge on mycotoxins and their importance.

CO4: Obtain knowledge on pathogenicity and laboratory diagnosis of medically important yeasts- *Candida* & *Cryptococcus*

CO5: Obtaining in-depth information on pathogenicity and laboratory diagnosis of – Dermatophytes, Superficial Mycoses, Subcutaneous Mycoses, and Systemic Mycoses.

CO6: Assimilate knowledge on Opportunistic fungal pathogens – *Cryptococcus*, *Aspergillus*

CO7: Grasp the basic and advanced knowledge on laboratory diagnosis of fungi

CO8: Gain the knowledge on antifungal agents & their testing methods.

UNIT I INTRODUCTION 12

Historical introduction to mycology. Structure and cell differentiation, unicellular and multicellular forms. Modes of reproduction – sexual, asexual and para sexual, life cycle patterns. Growth requirements and cultivation. Fungal virulence factors.

UNIT II IMPORTANCE OF YEASTS AND MYCOTOXINS 10

Yeasts of medical importance – *Candida*, *Cryptococcus sp.* Mycotoxicoses and Mycetismus.

UNIT III DERMATOPHYTES 14

Fungi of medical importance – Dermatophytes and Superficial mycoses- Piedra, Pityriasis versicolor, Tinea and Dermatophytosis. Subcutaneous mycosis- Mycetoma, Sporotrichosis, Chromoblastomycosis, Phaeohyphomycosis, Rhinosporidiosis; Systemic mycoses- Coccidioidomycosis, paracoccidioidomycosis.

UNIT IV MYCOTIC DISEASES

12

Opportunistic mycoses-Candidiasis, Cryptococcosis, Aspergillosis, Zygomycosis, Dimatiaceous fungi, Eumycotic mycetoma. Multiceps, Hymenolepis, Diphyllbothrium, Dipylidium.

UNIT V PATHOGENESIS AND CONTROL

12

Detection and recovery of fungi from clinical specimens. Advances in diagnostic mycology, antifungal agents- type and mode of action, testing methods and quality control. Immunity to fungal infection.

Total: 60 hours

TEXTBOOK:

Jagadish Chandar; A textbook of Medical Mycology. Interprint, New Delhi. 2002.

REFERENCE BOOKS:

1. Alexopoulos C.J; Introductory Mycology. John Wiley & Sons Inc, N.Y. 1992.
2. H.C. Dube, Introduction to Fungi, Vikas Publishing House. 3rd Edn., 2005.
3. D.R. Arora & B.R. Arora; Medical Parasitology, 1st Edn. CBS Publishers & Distributors, New Delhi. 2002.
4. Alexopoulos C.J. & H.C. Bold. Algae & Fungi. MacMillan & Co Ltd, London.2001.
5. Ainsworth G.C; A Dictionary of the Fungi. Commonwealth Mycological Institute, Kew. Surrey. 1971.
6. Bilgrami K.S., Verma R.N; Physiology of Fungi, Vikas Publishing House. 2nd Edn., 1994.

Course Objectives: The candidates will understand rDNA technology and strategies involved in genetic manipulations. The candidates will also gain knowledge on ethical issues involved in the system. Studying nanomicrobiology, the students will get necessary background information on nanotechnology in microbiological perspective and gain knowledge on nanoprocesses.

Course Outcome

At the end of the course, learners will be able to:

CO1: Basic understanding of genetic engineering.

CO2: Grasp the information on enzymes, vectors & techniques involved in genetic engineering

CO3: Gain knowledge on gene transfer techniques and screening methods

CO4: Obtain knowledge on uses of cloning in different fields of science

CO5: Obtaining in-depth information on Socio-economic ethics of cloning

CO6: Assimilate knowledge on basics of nanomicrobiology

CO7: Grasp the basic and advanced knowledge on techniques of microarray

CO8: Gain the knowledge on synthesis of nanoparticles

UNIT I INTRODUCTION

12

An overview of Genetic engineering- Isolation & purification of DNA from cells – Total, plasmid and phage DNA. PCR, Pulse field electrophoresis for large DNA. Restriction enzymes, DNA ligases, DNA modifying enzymes, Eukaryotic and Prokaryotic hosts for cloning. Characteristics of an ideal vector, cloning vectors – Plasmids, phages, Cosmids, Phagemids, Artificial chromosomal vectors, Shuttle vectors; choice of vectors for *E. coli*, fungi, higher plants and mammalian cells.

UNIT II GENE TRANSFER

12

Methods of gene transfer- Electroporation, transduction, and liposome mediated gene transfer. Direct transfer of DNA- Microinjection, particle bombardment. Screening of recombinants- Insertional inactivation and complementation, blue-white screening, immunodetection and radioactive probes.

UNIT III SELECTION OF RECOMBINANTS 12

Strategies for obtaining the clone of choice- Direct selection – selection from gene library. Construction of cDNA libraries. Uses of cloning in medicine, agriculture, forensic science and industries. Socio-economic ethics of cloning, NIH guidelines, GEO, GMF, future of cloning techniques.

UNIT IV NANOMICROBIOLOGY 12

Basics of Nanomicrobiology- introduction, landmarks in nanomicrobiology- Techniques: microarrays- nanoarrays- protein nanoarray. Atomic force microscopy- operation- advantages of AFM, Magnetic resonance force microscopy. Nanoparticles- Quantum dots, Gold nanoparticles, Silica nanoparticles, Fluorescent nanoparticles, cubosomes, Dendrimers, nanoparticle synthesis.

UNIT V NANOBIO TECHNOLOGY 12

Bacterial structures relevant to nanobiotechnology- Nanostructures on bacterial cell surface- bacterial magnetic particles- DNA nanotubes. Applications in Biology- NanoSystems Biology- Quantum dots for cell labeling and study of apoptosis- Nanofabricated structures for DNA separation- Nanopore sequencing- Nanomotor from DNA (Molecular motor). Nanoprobes for Analytical Applications- A new Methodology in medical diagnostics and Biotechnology- Nanosensors. Nanomicrobiology in drug delivery- viruses as nanomaterials for drug delivery- Bacteria mediated drug delivery- Dendrimers- Cubosomes- Gold nanoparticles- cyclodextrin.

Total: 60hours

TEXTBOOK:

T.A. Brown, Gene Cloning and DNA Analysis- An Introduction, Blackwell Science Publishers. Ed.4; 2001.

REFERENCE BOOKS:

1. Old, R.S and Primrose SB, Principles of Gene manipulation: An Introduction to Genetic engineering , Blackwell Scientific publications. Ed.5; 1995.
2. Glick B.R and Pasternak JJ, Molecular Biotechnology. ASM Press, Washington DC. 1994.
3. Clover D.M , DNA cloning series (Vol I-IV); IRL Press, Oxford. 1987.

4. Winnacker E L, From Genes to clones: Introduction to Gene technology; VCH Weinheim. 1987.
5. Satyanarayana. U, Biotechnology; Uppala- Author Publishers Linkers. 2005.
6. Tuan R.S , Recombinant Gene Expression Protocols; Humana Press. 1997.
7. M.Ratner and D.Ratner, Nanotechnology –A Gentle Introduction to The Next Big Idea, Pearson Education. 2007.
8. L.E.Foster, Nanotechnology-Science, Innovation and Opportunity, Person education Inc., 2007.
9. Charles P. Poole, Jr. and Frank J. Owens, Introduction to Nanotechnology; Wiley – Interscience. 2003.
10. Guozhong Cao, Nanostructures & Nanomaterials: Synthesis, Properties and Applications; Imperial College Press. 2004.
11. David S. Goodsell, Bionanotechnology: Lessons from Nature; Wiley-Liss, Inc. Hoboken, New Jersey. 2004.

15BMI020

Practical X – Lab in Virology and Bacteriology

0 0 4 2

Course Objectives: The candidate will gain hands-on knowledge and acquire adequate skill required to cultivate viruses in embryonated eggs, collection of clinical specimens, and identification of specific bacterial pathogens.

Course Outcome

At the end of the course, learners will be able to:

CO1: Know how to cultivate viruses

CO2: Know how to collect & transport clinical specimens

CO3: Assimilate knowledge on identification of bacterial pathogens

1. Cultivation of viruses by egg inoculation methods
2. Collection and transport of specimens- Faeces, pus, sputum, throat/ ear/ nasal/ wound swab, CSF.
3. Simple, differential and special staining methods.
4. Cultivation, transport, isolation and biochemical identification of pathogenic bacteria from pure culture - *Staphylococci*, *Streptococci*, *E. coli*, *Proteus*, *Klebsiella*, *Shigella*, *Salmonella*, *Vibrio*, *Pseudomonas*.

Total: 60hours

Course Objectives: The candidate will gain hands-on knowledge and acquire adequate skill required to identify fungal bodies in clinical samples and identify various pathogenic fungi and parasites based on morphology.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Analyse the clinical specimens for examination of fungi
- CO2:** Know how to cultivate fungi by employing different methods
- CO3:** Understand the concept of germ tube technique
- CO4:** Gain knowledge on examination of parasites from clinical specimens
- CO5:** Assimilate knowledge on examination of blood parasites

1. KOH examination of skin, hair and nail.
2. LPCB examination of fungi.
3. Cultivation and identification of fungi- *Mucor*, *Rhizopus*, *Aspergillus*, *Penicillium*, Dermatophytes and Yeasts on SDA/ Corn meal agar
4. Slide culture technique
5. Germ tube test
6. Examination of parasites in clinical specimens- Ova/ cyst in faeces by Lugol's iodine wet mount method.
7. Concentration methods for stool samples - Salt saturation methods.
8. Blood smear examination for malarial parasites.
9. Blood smear examination for microfilariae.

Total: 60hours

List of Discipline Specific Electives (Any 4 Papers)

5 0 0 4

- DSE1: 15BMI101 - Fermentation Technology**
- DSE2: 15BMI102 - Biochemistry**
- DSE3: 15BMI103 - Methods in Biochemistry (Practical)**
- DSE4: 15BMI104 - Bioinstrumentation**
- DSE5: 15BMI105 - Bioinstrumentation (Practical)**
- DSE6: 15BMI106 - Bioinformatics**
- DSE7: 15BMI107 - Bioinformatics (Practical)**
- DSE8: 15BMI108 - Human Biology**
- DSE9: 15BMI109 - Human biology (Practical)**
- DSE10: 15BMI110 - Microbial Biotechnology**
- DSE11: 15BMI111 - Environmental Biotechnology**
- DSE 12: 15BMI112 - Methods in Environmental Biotechnology (Practical)**
- DSE13: 15BMI113 - Biostatistics**
- DSE14: 15BMI114 - Microbial Metabolites**
- DSE15: 15BMI115 - Marine Microbiology**
- DSE16: 15BMI116 – Biofertilizers**
- DSE17: 15BMI117- Methods in Biofertilizers (Practicals)**
- DSE18: 15BMI118 – Immunotechnology**

Course Objectives: The candidate will gain knowledge about fermentation technology and requirements; various fermentor systems; production of commercially important microbial products

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Basic understanding of fermentation process and types.
- CO2:** Grasp the information on design of fermentor and its types
- CO3:** Gain knowledge on factors influencing fermentation process
- CO4:** Obtain knowledge on sterilization processes and their kinetics
- CO5:** Obtaining in-depth information on scale-up process
- CO6:** Assimilate knowledge on industrially important microbes
- CO7:** Gain the knowledge on commercial production of fermentation products

UNIT I INTRODUCTION 15

General consideration of fermentation process. Types of fermentation-submerged, solid state, batch, fed batch, continuous, single, dual, multiple. Design of fermentor. Types of fermentor-Air lift, cylindro conical, fluidized bed, stirred, Tower fermentor, growth kinetics of batch and continuous culture-chemostat and turbidostat. Primary and secondary metabolites-product fermentation kinetics.

UNIT II FACTORS INFLUENCING FERMENTATION 15

Media formulation- Strategy involved, aeration and agitation. Factors affecting oxygen transfer – Determination of $K_L a$ Values-newtonian and non Newtonian fluids. Physical and chemical environmental sensors, fermentation control systems-manual and automatic.

UNIT III STERILIZATION 15

Sterilization-Types of sterilization, batch and continuous, Insitu and exsitu. Sterilisation of media, bioreactor and accessories, fed additives. Sterilisation kinetics – del factor, TDT, 12 D concepts, asepsis and containment – GMP, GILSP, HACCP, IPR, TRIPS, GATT.

UNIT IV INDUSTRIALLY IMPORTANT MICROORGANISMS 15

Screening and selection of industrially important cultures. Inoculum development, strain development, scale up process and downstream processing.

UNIT V COMMERCIAL PRODUCTION

15

Commercial fermentation products – enzymes – protease, amylase, lipase, cellulase, organic solvents – ethanol, butanol, Acids-Acetic acid and lactic acid, SCP-BGA, Vitamins – Vit B12, Vit C. Ammino acids-glutamic and threonine. Non microbial products produced through microbes – Hormones – GH, IFN, tpA, B-cell growth factor.

Total: 75hours

TEXT BOOKS:

1. Stanbury PF, Whitaker A, Hall SJ; Principles of fermentation technology Pergamon press. 1995.
2. Mukhopadhyay S., process Biotechnology fundamentals Viva books Pvt Ltd. 2nd edn., 2004.

REFERENCE BOOKS:

1. Cruegar and Cruegar. Biotechnology – Industrial Microbiology (1st edn). 1988.
2. Patel, AH. Industrial Microbiology; Mc. Millan pvt. Ltd. 1st edn., 2004.
3. Anton Moser, Bioprocess technology – Kinetics and reaction;. Springer Verlag, Newyork wein. 1st edn., 1988
4. El-Mansi, EMT. Fermentation Microbiology and Biotechnology; Taylor and Francis Publishers. 2005.
5. Balasubramanian, D., Bryce CFA, Dharmalingam, K., green J., Kunthala Jayaraman. Concepts of Biotechnology; University press. Revised edn., 2004

Course Objectives: The candidate will gain knowledge about the structure, properties and functions of carbohydrates, proteins, lipids and nucleic acids. Basic biochemical techniques are also dealt with.

Course Outcome

At the end of the course, learners will be able to:

CO1: Basic understanding of carbohydrates.

CO2: Grasp the information on carbohydrate metabolism.

CO3: Gain the basic knowledge on proteins.

CO4: Obtain knowledge on structure, classification & biological roles of proteins

CO5: Obtaining in-depth information on lipids and their classification.

CO6: Assimilate knowledge on biosynthesis and metabolism of lipids

CO7: Grasp the basic knowledge on DNA & RNA and their biosynthesis

CO8: Gain the knowledge on different chromatographic methods.

UNIT I CARBOHYDRATES 15

Carbohydrates – Classification, structure of mono, oligo and polysaccharides. Glycolysis, TCA cycle, HMP shunt, Oxidative Phosphorylation and its inhibitors.

UNIT II PROTEINS 20

Protein – Classification, amino acid – structure and classification. Biological role of proteins and structural organization of protein. Transamination, deamination and urea cycle and its regulation.

UNIT III LIPIDS 15

Lipids – Classification, Saturated and Unsaturated fatty acids. Biological functions of lipids. Biosynthesis and oxidation of fatty acids, structure, function and metabolism of cholesterol.

UNIT IV NUCLEIC ACIDS**20**

Nucleic acid – Nucleosides, Nucleotides, Structure of DNA and RNA – various types of RNA. Biosynthesis and degradation of purine and pyrimidine.

UNIT V CHROMATOGRAPHY**20**

Chromatography – gel filtration, affinity, HPLC. Centrifugation – differential centrifugation. Electrophoresis – SDS-PAGE, Agarose gel electrophoresis.

Total: 90hours**TEXTBOOK:**

J.L. Jain, Fundamentals of Biochemistry; Chand Publications. 2006.

REFERENCE BOOKS:

1. Harper's Biochemistry; Robert.K. Murray Lance International Publication, 26th edition, 2005.
2. M.N. Chatterjee, Text Book of Medical Biochemistry; Jaypee Publication. 6th edition, 2006
3. U. Sathyanarayana, Biochemistry; Books and Allied (P) Ltd. 2006. 3rd edition

Course Objectives: The candidate will gain knowledge and skills required detecting carbohydrates, amino acids, and also estimating the amount on biomolecules in the given solutions.

Course Outcome

At the end of the course, learners will be able to:

CO1: Acquire skills on estimation of mono- and di-saccharides .

CO2: Know how to estimate polysacchrides

CO3: Gain the basic skill on analysis of amio acids.

CO4: Competently perform estimation og glucose & proteins

CO5: Gain the knowledge on thin layer chromatographic method.

1. Qualitative analysis of monosaccharides – Aldose.
2. Qualitative analysis of monosaccharides – Ketose.
3. Qualitative analysis of disaccharides.
4. Qualitative analysis of polysaccharides.
5. Qualitative analysis of aromatic amino acids.
6. Qualitative analysis of sulphur containing amino acids.
7. Qualitative analysis of basic amino acids.
8. Estimation of glycine by Sorrenson's Formal Titration.
9. Estimation of ascorbic acid by 2,3 Dichlorophenol Indophenol.
10. Estimation of glucose by Ortho Toluidine method.
11. Estimation of protein by Lowry's method.
12. Separation of amino acids by thin layer chromatography.

Total: 60hours

UNIT V RADIOISOTOPES

15

Use of radioisotopes in life sciences, radioactive labeling, principle and application of tracer techniques, detection and measurement of radioactivity using ionization chamber, proportional chamber, Geiger- Muller and Scintillation counters, autoradiography and its applications.

Total: 75hours

TEXTBOOK:

Chatwal G and Anand, S. ; Instrumental Methods of Chemical Analysis. Himalaya Publishing House, Mumbai. 1989.

REFERENCE BOOKS:

1. H.H. Willard, L.L. Merritt Jr. ;Instrumental Methods of Analysis. CBS Publishers and Distributors. 6th Edition, 1986.
2. Williams, B.L. and Wilson, K.; A Biologists Guide to Principles and Techniques of Practical Biochemistry. Wiley. 2000.
3. B.B. Straughan and S. Walker.; Spectroscopy. Volume 1. Chapman and Hall Ltd.1999.
4. James Miller. Chromatography: Concepts and Contrasts;John Wiley and Sons.Inc., New York. 1988.
6. R. J. Hamilton and P. A.Sewell. Introduction to High Performance Liquid Chromatography, Chand & Co. 2010.
7. Gordon M. Message, Practical aspects of Gas Chromatography and Mass Spectrometry ; John Wiley and Sons, New York. 1984.
8. Tibor Kremmery. Gel Chromatography. Wiley Publications. 2000.
9. C.C. Thornburn, Isotopes and radiations in Biology, Butterworth and Co. Ltd.,London. 1999.

15BMI105

Bioinstrumentation (Practical)

0 0 4 2

Course Objectives: The candidate will gain knowledge and skills required to separate amino acids, serum, haemoglobin.

Course Outcome

At the end of the course, learners will be able to:

CO1: Acquire skills on chromatographic methods.

CO2: Know how to determine pH

CO3: Gain the basic skill on gel electrophoresis

CO4: Competently perform gel filtration

1. Separation of amino acids by Paper Chromotography.
2. Separation of amino acids by TLC.
3. Separation of serum protein by horizontal submerged gel electrophoresis.
4. Study of UV absorption spectra of macromolecules - protein, nucleic acid.
5. Demonstration of PCR.
6. Separation of haemoglobin or blue dextran by gel filtration.
7. Paper electrophoresis.
8. Demonstration of Fermenter.
9. Determination of pH of various solutions.

Total: 60hours

15BMI106

Bioinformatics

5 0 0 4

Course Objectives: The candidate will gain knowledge about the computerization of biological information – data analysis and retrieval systems: NCBI, DDBJan, EMBL, SGD, TIGR and ACeDB.

Course Outcome

At the end of the course, learners will be able to:

CO1: Basic understanding of Computers & programming languages

CO2: Grasp the information on input & output devices of a computer

CO3: Gain basic knowledge on Bioinformatics

CO4: Obtain knowledge on biomolecules

CO5: Obtaining in-depth information on biological databases

CO6: Assimilate knowledge on genome and structure databaese

UNIT I COMPUTER, LANGUAGE, DEVICES

18

Computer and Programming Languages. Introduction to Computers: Introduction – Types of Computers – Characteristics of Computers. Generations of Computers - Classification of Computers – Programming Languages: Machine Language – Assembly Language – High level languages. Input Devices- Keyboard – Mouse - Types of mice – Connections – Mouse Pad - Trackball –Joystick - Output Devices – Dot Matrix Printer – Inkjet – Laser Printer – LCD and LED Printers– Line Printer Auxiliary Storage Devices : Hard Disk – CD –DVD – primary memory

CO6: Skillfully to know motif analysis

1. Handling of computer and listing specifications and characteristics of all parts of computer system available in the laboratory
2. Learning the intranet system in the laboratory and getting its characteristics.
3. Retrieval of the sequence information from NCBI.
4. Retrieve the sequence information and file format of Nucleotide using EMBL.
5. Accessing the information of Nucleotide sequence using DDBJ
6. Protein sequence information using Swissprot.
7. Secondary information of a protein using SCOP
8. Motif analysis of a protein sequence using Motif search
9. Analysis - the family of protein sequence using Pfam.
10. 3D structure of protein from PDB

Total: 60hours

15BMI108

Human biology (Theory)

5 0 0 4

Course Objectives: The candidate will gain knowledge about the nutritional and dietary values and requirements; various systems of the human body; Human chromosome and related features with problems associated; Diseases, vaccination and population control.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Have knowledge about the organization of human body – cells to organ systems; and diet requirements and consequences of improper diet.
- CO2:** Gain suitable understanding about all organs and organ systems involved in the functioning of the human system.
- CO3:** A complete understanding of chromosomal organization; function, disorders and changes.
- CO4:** An overview of diseases – causes, outcomes and control; pertaining to communicable and noncommunicable diseases.
- CO5:** Appreciation of various aspects of vaccination regimes; drug addiction symptomology and control as well as birth control.

UNIT I BODY SYSTEM, FOODS AND DIET 15

Origin and evolution of man. Cell structure. Cellular Basis of Life; Organization and regulation of Body Systems. Dietary principles. Proteins, carbohydrates, fats, vitamins, minerals and water. Food groups- (cereals, pulses, nuts and oil seeds, Green Leafy Vegetables (GLV) - root vegetables, other vegetables, fruits). Dietary fibre, antioxidants, milk and milk products, sugar, flesh foods, eggs. Balanced food. Breast feeding. Malnutrition. Consequences of protein, mineral and vitamin deficiencies.

UNIT II STRUCTURE AND FUNCTIONS OF BIOLOGICAL SYSTEMS 18

Outlines of the structure and functions - skeleton, muscular, digestive, respiratory, circulatory, urinary, immune and reproductive systems; Integration in human - nervous, endocrine system and human Sense organs - human skin, eye and ear.

UNIT III CHROMOSOMES AND DISORDERS 12

Chromosome – structure, gene transcription & recombination; Sex linkage and mapping; Sex linked disorders; Chromosomal aberration; mutation.

UNIT IV COMMUNICABLE AND NON - COMMUNICABLE DISEASES 15

General awareness of common Communicable and non - Communicable diseases of man : Cancer, Cardiovascular diseases - Ischaemic - Rheumatic - Stroke, Obesity, Diabetes, Hypertension, Allergy, Mental Disorder - Depression - Schizophrenia, Alzheimer, Blindness - Cataract - Trachoma - Glaucoma and Kidney diseases - Nephritis - Uremia - kidney / bladder stone.

UNIT V VACCINATION, DRUG ADDICTION AND POPULATION CONTROL 15

Fundamentals of Vaccination against Measles (Rubella), Mumps, Diphtheria, Pertussis, Tetanus, Tuberculosis, Poliomyelitis, Hepatitis B, Japanese Encephalitis, Typhoid and Varicella. Alcoholic beginning, effect on the body and mind, treatment. Drug addiction - marijuana, heroin, barbiturate, morphin, opium, cocaine - treatment. Smoking - ill effects. Population control - contraception and Family Planning.

Total: 75hours

TEXTBOOK:

Donald J. Farish. Human Biology. Chand & Co.1993.

REFERENCE BOOKS:

1. Clifford R.Anderson. Modern Ways to Health. Volume II. Southern Publishing Association, Nashville, Tennessee. 1962.

2. Biology, An Inquiry Into Life. Volume I. Tata- McGraw- Hill Publishing Co., Ltd., New Delhi. 1971.
3. Sylvia S. Mader. Human Biology. McGraw-Hill ISE. 2007.
4. Belk, Colleen, Borden, Virginia. Human Biology. Benjamin - Cummings Publishing Company. ISBN. 2007.

15BMI109

Human biology (Practical)

0 0 4 2

Course Objectives: The candidate will gain knowledge and skills required to determine the human body temperature, BP. Detect starch, glucose and proteins. Study the reproductive system of animal.

Course Outcome

At the end of the course, learners will be able to:

CO1: Acquire basic skills on handling of thermometer

CO2: Know how to use Stethoscope & BP apparatus

CO3: Gain the basic skill on estimation of amylase in saliva

CO4: Competently to do microscopic analysis of onion root

CO5: Understand Human visions

CO6: know how to perform heart beat experiment

1. Use a thermometer, stethoscope, BP apparatus
2. Nutrient tests -Test for starch, glucose, protein, lipid
3. Enzymes – Salivary amylase activity
4. Respiration - in living organisms
5. Diffusion and Osmosis
6. Mitosis – microscopic observation of onion root tip.
7. Heart beat Experiment - Frog
8. Human vision – visual activity, color blindness
9. Reproductive system – any available animal
10. Human Memory Test
11. Animal behaviors – any animal – cat, dog etc
12. Population Study (fertility study)– field trip

Total: 60hours

Course Objectives: The candidates will be aware of the wide applications of microorganisms in industries, appreciate the use of microbes in biotransformation processes and production of industrially important products, and understand the potentials of microbes in rDNA technology to manufacture genetically engineered therapeutics.

Course Outcome

At the end of the course, learners will be able to:

CO1: Gain knowledge on Industrially important microbes

CO2: Get complete knowledge on the applications in Industries

CO3: Obtain detailed knowledge on Biotransformation reactions

CO4: Acquire clear view about Microbial production of Organic solvents

CO5: Comprehensive knowledge on Applications & Microbial production of Antibiotics

CO6: Inclusive knowledge on Microbial production of Vitamins

CO7: Broad knowledge on Microbial production of Foods

CO8: Attain complete knowledge on Alcoholic beverages

CO9: Conquer knowledge on Applications of Genetic Engineering & rDNA technology

CO10: Accomplish knowledge on production of vaccines, Hormones and Blood proteins.

UNIT I INDUSTRIALLY IMPORTANT MICROBES

12

Biology & Genetics of industrially important microbes- *Streptomyces*. Non Streptomyces Actinomycetes, *E.coli*, *Corynebacterium*, *Bacillus*, Filamentous fungi, *Saccharomyces*, Non Saccharomyces industrial yeasts, Algae- *Spirulina*, *Chlorella* & *Scenedesmus*.

UNIT II BIOTRANSFORMATION

15

Types of Biotransformation reactions. Biotransformation of steroids, antibiotics, arachidonic acid, glycerol, Biotransformation for production of ascorbic acid & indigo. Microbial production of Organic solvents- ethanol, acetone, butanol & glycerol. Microbial production of Organic acids- acetic acid & citric acid.

UNIT III MICROBIAL PRODUCTION OF ANTIBIOTICS AND VITAMINS 15

Applications & Microbial production of Antibiotics- Penicillins, Cephalosporins. Streptomycin, Tetracyclines & Griseofulvin. Microbial production of Amino acids- L- glutamic acid & L- lysine. Microbial production of Vitamins- Vit B12, Riboflavin & Vit C.

UNIT IV FERMENTATION PRODUCTS 15

Microbial production of Foods. Fermented foods- cheese, yoghurt, sauerkraut, bread, sweeteners, flavor enhancers. Oriental fermented foods- soya sauce, koji & miso. Microbial production of Alcoholic beverages- beer, wine & whisky. SCP & Mushrooms. Biofertilizers & Biopesticides.

UNIT V rDNA TECHNOLOGY 15

Applications of Genetic Engineering & rDNA technology. Recombinant vaccines- subunit, DNA & vector vaccines. Hormones- insulin & human growth hormone. Blood proteins- tissue plasminogen activator, interferons & erythropoietin. Monoclonal antibodies.

Total: 75hours

TEXTBOOK:

U.Sathyanarayana, Biotechnology; Books and Allied Ltd. 2008.

REFERENCE BOOKS:

1. Arnold .L, Demain and Davis. J. E., Manual of Industrial Microbiology and Biotechnology; ASM Press. Washington DC. 1999.
2. Stanbury. P .F, Whitaker. A. Hall. S. J, Principles of Fermentation Technology; Pergamon Press. 1995.
3. Reed. G, Prescott and Dunn's Industrial Microbiology; Macmillan Publishers. 1982.
4. W.B. Hugo and A. D. Russell, Pharmaceutical microbiology, Ed. 6; Blackwell scientific publications. 2002.
5. S.P.Vyas, V.K. Dixit, Pharmaceutical Biotechnology; CBS publishers and Distributors, New Delhi. 2004.
6. Rajesh Bhatia, Ratanlal Ihhpunjani, Quality assurance in Microbiology; CBS publishers and distributors, New Delhi. 2005.

Course Objectives: The candidates will understand microbial interactions with environment and their association with diseases. The students will also appreciate the role of microbes in waste treatment and biodeterioration.

Course Outcome

At the end of the course, learners will be able to:

CO1: Gain knowledge about the role and infections caused in air.

CO2: Obtain complete knowledge on Microorganism inhabiting extreme environments.

CO3: Gain detailed knowledge on aquatic ecosystems.

CO4: Get clear view about Water borne diseases.

CO5: Acquire detailed knowledge on solid and liquid wastes

CO6: Assimilate knowledge on Solid waste treatment and Utilization of solid wastes.

CO7: Know in-depth information on Waste water treatment and its different methods.

CO8: Attain information on Biodeterioration.

UNIT I MICROBIAL ECOLOGY

16

Concepts of microbial ecology: Relationship between microorganism and different environments land, water and air. Microorganism inhabiting extreme environments. Microbiology of air – organisms in air, distribution and sources. Droplet nucle, aerosol, assessment of air quality, solid – liquid – impingement methods. Brief account of air borne transmission of harmful microbes.

UNIT II AQUATIC ECOSYSTEMS

16

Types of aquatic ecosystems: fresh water – ponds, lakes, streams. Marine habitats – estuaries, mangroves, deepsea, hydrothermal vents, salt pans, coral reefs. Zonations – upwelling – eutrophication – food chain. Potability of water – microbial assessment of water quality – water purification – brief account of water – borne diseases.

UNIT III SOLID AND LIQUID WASTES

13

Types of wastes – characterization of solid and liquid wastes. Solid waste treatment – saccharification – gasification – composting, Utilization of solid wastes – food (SCP, mushroom, yeast); fuel (ethanol, methane, hydrogen); fertilizers

UNIT IV LIQUID WASTE TREATMENT 15

Liquid waste treatment. Treatment methods – primary –secondary (anaerobic – methanogenesis; aerobic- tricking activated sludge – oxidation pond – tertiary treatment. Utilization of liquid wastes – food (SCP, Yeast) – fuel (methane), fertilizers

UNIT V BIODETERIORATION 15

Biodeterioration: Deterioration of paper, leather, wood, textiles, metal corrosion, mode of deterioration, organisms involved, its disadvantages and mode of prevention.

Total: 75hours

TEXTBOOK:

Pradipta Kumar Mohapatra; TEXTBOOKS of Environmental Biotechnology; I.K.International. 2007.

REFERENCE BOOKS:

1. Baker, W.C. and Herson, D.S.1994. Bioremediations – McGraw Hill Inc., New York
2. W.Nybakken, 1982. Marine Biology – An Ecological Approach. Ames Harper and Row Publisher, New York.
3. K.C.Marshall, 1985. Advances in Microbial Ecology. Vol-8. Plenum press.
4. Burns, R.C. and Slater, J.H. 1982. Experimental Microbial Ecology – Blackwell Scientific Publications, Oxford, London.
5. Gareth M. Evans, Judith C. Furlong; Environmental Biotechnology: Theory and Application, Wiley. 2ed. 2010.

15BMI112 Methods in Environmental Biotechnology (Practical) `0 0 4 2

Course Objectives: The candidate will gain practical knowledge about microbes in air, air sanitation and quality assessment. They will acquire hands on training in testing the water for potability and also gain practical knowledge on bacterial flora on fuel contaminated soils.

Course Outcome

At the end of the course, learners will be able to:

CO1: Gain practical knowledge on the microbial flora of air.

CO2: Assess the microbiological quality of air.

CO3: Perform analysis of water quality and check for potability

CO4: Confidently isolate and characterize the bacterial species from fuel contaminated soils.

1. Assessment of Air quality by Open Plate Method
2. Enumeration of Microbes by Air Sampling Method
3. Evaluation of Quality of Water by Standard Plate Count Method
4. Analysis of Water by Most Probable Number Technique
5. Sterilization of Water by Membrane Filtration Technique
6. Isolation and Characterization of Bacteria from Crude Petroleum Contaminated Soil
7. Determination of Total Hardness and Alkalinity of Water
8. Determination of Total Dissolved Solids of Water

Total: 60 hours

15BMI113

Biostatistics (Theory)

5 0 0 4

Course Objectives: The candidates will gain knowledge in the statistical approach of scientific methods. The students will develop analytical and problem solving skills in addition to the design of experiments.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Basic understanding of Biostatistics.
- CO2:** Grasp the information on kinds of biological data
- CO3:** Gain knowledge on collection of data
- CO4:** Obtain knowledge on sampling and sampling design
- CO5:** Obtaining in-depth information on Correlation
- CO6:** Assimilate knowledge on Regression and types
- CO7:** Grasp the knowledge on Deviations
- CO8:** Gain the knowledge on graphic representations

UNIT I INTRODUCTION TO BIOSTATISTICS

15

Introduction to biostatistics – Definition, statistical methods, biological measurement, kinds of biological data, functions of statistics and limitation of statistics.

UNIT II DATA COLLECTION 15

Collection of data, sampling and sampling design, classification and tabulation, types of representations, graphic – bar diagrams, pie diagrams and curves.

UNIT III METHODS OF CORRELATION 15

Correlation – different types of correlation – positive, negative, simple, partial, multiple, linear and non linear correlation. Methods of studying correlations.

UNIT IV REGRESSION AND ITS TYPES 15

Regression, types and methods of analysis. Regression line, Regression equations, Deviation taken from arithmetic mean of X on Y, Deviation taken from the assumed mean.

UNIT V MEASURES OF DEVIATIONS 15

Measures of dispersion and variability, changes. Deviations – Quartile deviation, mean deviation, standard deviation, coefficient of variation, Lorenzen's curve.

Total: 75hours

TEXTBOOK:

Khan, Fundamentals of Biostatistics, Uhaaz Publications, 1994.

REFERENCE BOOKS:

1. Palanisamy. S. and Manoharan, M. Statistical methods for Biologists (Biostatistics). Palani Paramount Publications, TamilNadu. 1994.
2. Arora, P.N. and Malhan, P.K. Biostatistics. Himalaya Publishing House, Mumbai. 1996.
3. Stanton. A.Clantz. Primer of Biostatistics – The McGraw Hill Inc. New York.1997.
4. Sokal and Rohlf. Introduction to Biostatistics – Toppan Co. Japan. 1973.
5. A. K. Vashisth. Encyclopedia of Biostatistics; Neha Publishers & Distributors. 2007.
6. Suresh Kumar, Satya veeri, Basic Biostatistics; Neha Publishers & Distributors. 2010.

TEXTBOOK:

Albert G.Moat, John W. Foster, Michael P.Spector, Microbial Physiology, John Wiley & Sons. Ed. 4; 2006.

REFERENCE BOOKS:

1. David White, The Physiology and Biochemistry of Prokaryotes; Oxford University Press. 1995.
2. Michael T. Madigan, John M Martinko, Brock's Biology of Microorganisms, Pearson-Prentice Hall. Ed. 11; 2006.
3. Albert G.Moat, John W. Foster, Michael P.Spector, Microbial Physiology, John Wiley & Sons. Ed. 4; 2006.
4. Ronald M.Atlas, Principles of Microbiology, WCB Publishers. Ed. 2; 1997.
5. Alberts B.Dray, J Lewis, M Raff, K Roberts, JD Watson, Molecular Biology of The Cell, Garland Publishing. Ed. 3; 1994.
6. Neidhart FC, JL Ingraham, M Schaecter, Physiology of the Bacterial Cell: A Molecular Approach; Sinauer-Sunderland. 1990.
7. Dawes EA, IW Sutherland, 1992; Microbial Physiology, Ed. 2; Blackwell Scientific.
8. Gottschalk G, Bacterial Metabolism, Springer-Verlag. Ed. 2; 1996.
9. Kates M, D Kushner, AT Matthews, The Biochemistry of Archae; Elseiver. 1993.
10. Topley & Wilson's: Principles of Bacteriology, Virology, & Immunology; Edward Arnold. Ed. 9; 2002.

15BMI115

Marine Microbiology (Theory)

5 0 0 4

Course Objectives: The candidates will understand the ecological role of microbes in marine environment, marine symbiosis. The paper also instill in students the influence of marine microbes in human health and the biosphere.

Course Outcome

At the end of the course, learners will be able to:

CO1: Acquire knowledge about the ecological role of microbes in marine environment.

CO2: Learn about the microbial communities in the aquatic environment.

CO3: Understand the kinetics of aquatic microbial population and microbial interactions – symbiosis, antagonism and commensalisms.

CO4: Obtain information about the types of water ecosystems.

CO5: Gain knowledge in the biological pollution and their effect of marine ecosystems.

CO6: Attain knowledge about the microbiological aspects of potable, fresh water, and waste water.

CO7: Assimilate information about the waterborne human diseases.

CO8: Learn about the eutrophication.

Eutrophication: Definition, causes of eutrophication, and microbial changes in eutrophic bodies of water induced by various inorganic pollutants. Effects of eutrophication on the quality of water environment, factors influencing eutrophication. Qualitative characteristics and properties of eutrophic lakes. Algae in eutrophication, algal blooms, their effects and toxicity, coloured waters, red tides, and cultural eutrophication. Physico-chemical and biological measures to control eutrophication.

Total: 75hours

TEXTBOOK:

Jeffery S Livinton; Marine Microbiology. Oxford university Press. 3rd ed., 2009.

REFERENCE BOOKS:

1. Rheinmer, G. Microbial Ecology of Brackish Water environment: Ecological Studies – Vol-25, Springer – Verlag Nerlin – Heidellberg New York. 1977.
2. William M., Lewis Jr. James. F. Saunders. David W. Crumpacker. Sr. and Charles Brebdecke., Ecologica Studies – Vol 46. Wiley Science. 1994.
3. Bernt Zeitzschel, Sebastian A. Gerlach The Biology of Indian Ocean. Ecological studies. Vol. III. Blackwell Scientific Publications, 1973.
4. W. Nybakken, Marine Biology – An Ecological Approach. Ames Harper and Row Publisher, New York. 1982.
5. K.C. Marshall, Advances in Microbial Ecology. Vol-8. Plenum press. 1985.
6. Burns, R.C. and Slater, J.H. Experimental Microbial Ecology – Blackwell Scientific Publications, Oxford, London. 1982.
7. Anand Kumar; Ecology of Polluted Water – Vol. II, Aph Pub. Co. New Delhi. 1990.
8. Colin Munn; Marine Microbiology; Taylor and Francis. 2011.

Course Objectives: The candidates will understand the potentials of microbes as fertilizers, important microbes as biofertilizers and their beneficial impacts on the soil and agriculture.

Course Outcome

At the end of the course, learners will be able to:

CO1: Acquire knowledge about the role and importance and significance of biofertilizers.

CO2: Become trained in mass production and applications of bio fertilizer and their impact on plant growth.

CO3: Obtain in-depth information on the mycorrhizal taxonomy, occurrence, distribution.

CO4: Learn about the types of mycorrhizal associations.

CO5: Know-how in isolation of VAM and also its influence on growth and yield of crop plants.

CO6: Assimilate knowledge on green manuring.

CO7: Understand recycling of biodegradable municipal, agricultural and industrial wastes.

CO8: Learn about the method of vermicompost preparation and its field applications.

UNIT I INTRODUCTION 15

General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.

UNIT II AZOSPIRILLUM 15

Isolation and mass multiplication – carrier based inoculant, associative, effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.

UNIT III CYANOBACTERIA AND AZOLLA 15

Cyanobacteria (blue green algae) Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.

UNIT IV MYCHORRIZA 15

Mycorrhizal association: Types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

UNIT V ORGANIC FARMING 15

Green manuring and organic fertilizers, Recycling of biodegradable, municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field application.

Total: 75hours

TEXTBOOK:

P.C.Trivedi, Biofertilizers; Neha Publishers. 2008.

REFRENCE BOOKS:

- 1.Dubey, R.C., A Text book of Biotechnology S.Chand & Co, New Delhi. 2005.
- 2.Kumaresan, V., Biotechnology, Saras Publications, New Delhi. 2005.
- 3.John Jothi Prakash, E., Outlines of Plant Biotechnology. Emkay Publication, New Delhi. 2004.
- 4.Sathe, T.V., Vermiculture and Organic Farming. Daya Publishers.2004.
- 5.Subha Rao, N.S. Soil Microbiology, Oxford & IBH Publishers, New Delhi.2000.
- 6.Vayas,S.C, Vayas, S. and Modi, H.A. Bio-fertilizers and or ganic Farming Akta Prakashan, Nadiad.1998.
7. H.C.Lakshmi, Biofertilizers & Biopesticides; Neha Publishers. 2014.

Course Objectives: The candidate will gain knowledge and skills in enumeration, isolation and mass production of different types of biofertilizers

Course Outcome

At the end of the course, learners will be able to:

CO1: Acquire basic skills on enumeration, isolation & characterization of microbes in soli

CO2: Know how to prepare biofertilizers

CO3: Understand the importance of phosphate solublizing bacteria

CO4: Competently to do isolation of *Rhizobium* from root nodules

CO5: Understand significance of biofertilizers

1. Enumeration of bacteria, and fungi in soil
2. Isolation and characterization of Actinobacteria from soil
3. *Azotobacter*: Enumeration, isolation, and mass multiplication
4. *Azospirillum*: Isolation and characterization from cereals
5. Isolation of diazotrophic *Gluconacetobacter diazotrophicus* from sugarcane
6. Isolation of phosphate solubilizing bacteria and determination of phosphate solubilization index.
7. Isolation of *Rhizobium* from legumes
8. Mass production of biofertilizer, and preparation of carrier based inoculant
9. Biofertilizer- Seed treatment methods
10. VAM colonization assessment
11. Economics of biofertilizer production
12. Visit to biofertilizer production unit

Total : 60hours

Course Objectives: The candidates will understand basic principles in immunology and immunological methods. The paper instills in the students the concepts of immunoengineering of antigens and antibodies.

Course Outcome

At the end of the course, learners will be able to:

CO1: Learn about the basic principles in immunology and immunological methods.

CO2: Learn about the preparation of antigens from pathogens and polyclonal, monoclonal and humanized antibodies

CO3: Understand molecular engineering methods to improve the specificities of immunology reactions.

CO4: Understand the evaluating effect of immune cells.

CO5: Understanding of the principles of immunohaematology methods and their use in scientific research.

UNIT I ANTIGEN-ANTIBODY REACTIONS

15

Antigen-Antibody reactions- Precipitation- types-immunodiffusion methods-Agglutination-types-immunofluorescent techniques-principles- typical protocol -types- RIA-principles-typical protocol-ELISA-different types-Ag coating-Ab coating-linking of enzymes to Abs-substrates. Immunoelectrophoresis-immunoblotting.

UNIT II PREPARATION OF ANTIGENS

15

Preparation of antigens-bacterial, fungal, viral pathogens-different methods. Standardization of antigens-quantification. Raising of polyclonal antibodies in animals-different routes of inoculation- immunization protocol- purification of immunoglobulins of different classes-quantification.

UNIT III MOLECULAR ENGINEERING METHODS

15

Molecular engineering methods – improve and modify immunological specificities and reactions. Antigen engineering for better immunogenicity and use for vaccine development. Antibody engineering – development of monoclonal antibodies and fragments using cellular and molecular technologies- cloning methods, production, purification and characterization of mAbs. Production of human monoclonal antibodies and their applications. Antibodies for diagnosis and therapy.

UNIT IV SEPARATION OF IMMUNE CELLS

15

Separation of immune cells-T cells- B cells- Macrophages- density gradient-lymphocyte stimulation test- flow cytometry-T cell subset analysis- B cell analysis. Delayed Type Hypersensitivity estimation methods- macrophage migration inhibition assays- purification and assay of interleukins.

UNIT V IMMUNOHAEMATOLOGY

15

Immunohaematology-blood groups- methods of blood grouping- reverse grouping- uses in forensic science-coombs test- blood banking. HLA typing- Tissue typing.

Total: 75hours

TEXTBOOK:

B.Annadurai, Textbooks of Immunology & Immunotechnology; Chand & Co., 2008.

REFERENCE BOOKS:

1. D.P. Stites, JD Stobo, H.H. Fudenberg, J.V. Wells, Basic and Clinical Immunology. Lange Medical Publications. Ed.8; 2006.
2. Pravash Sen. Gupta, 2003; Clinical Immunology; Oxford University Press.
3. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. III edition; ASM. 1986.
4. Leslie Hudson and Frank C. Hay, Practical Immunology, Ed.3; Blackwell Scientific Publication. 1989.
5. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
6. Carl A. K. Borreback, Antibody Engineering,Ed.2; Oxford University Press. 1995.
7. Leonore A. Herzenberg, Donald M. Weir, Leonard A. Herzenberg, Caroline Blackwell, Weir's Handbook of Experimental Immunology, Vol. I – IV; Blackwell Science. 1996;
8. Stefan H.E. Kaufmann and Dieter Kabelitz, Immunology of Infection. Methods in Microbiology. Vol. 25; Academic Press. 1998.
9. Sringer, T.A, Hybridoma Technology in the Biosciences and Medicine; Plenum Press. New York. 2004.
10. Garrison Fathman. C., Fitch, F.W., Isolation, Characterization and Utilization of T lymphocyte clones; Academic Press. 2003.
11. G.P.Talwar and S.K.Gupta., A Handbook of Practical and Clinical Immunology, Vol.I-II; CBS Publishers & Distributors. Delhi. 1993.

List of Generic Electives (Any Four Papers)

2 0 0 2

GE 1: 15BMI151 - Introduction and Scope of Microbiology

GE 2: 15BMI152 - Bacteriology and Virology

GE 3: 15BMI153 - Microbial Metabolism

GE 4: 15BMI154 - Industrial and Food Microbiology

GE 5: 15BMI155 - Microbes in Environment

GE 6: 15BMI156 - Medical Microbiology and Immunology

GE 7: 15BMI157 - Genetic Engineering and Biotechnology

GE 8: 15BMI158 - Microbial Genetics and Molecular Biology

15BMI151

Introduction and Scope of Microbiology (Theory)

2 0 0 2

Course Objectives: The candidates will understand the development of microbiology, diversity of microorganisms, Microscopy and other microbiological concepts.

Course Outcome

At the end of the course, learners will be able to:

CO1: Learn basics of microbiology

CO2: Learn about the significance of classification and features of microbes.

CO3: Able to suitably address the ways to view microbes and the role of fermentations in human activity.

CO4: Gain knowledge regarding control of microbes, uses and impact of microorganisms regarding food.

CO5: Comprehend the role of microorganisms in health and environment.

UNIT I

HISTORY OF DEVELOPMENT OF MICROBIOLOGY

6

Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming. Role of microorganisms in fermentation, Germ theory of disease,

UNIT II

DIVERSITY OF MICROORGANISMS

6

Systems of classification : Binomial nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. General characteristics of different groups: Acellular microorganisms and Cellular microorganisms giving definitions and citing examples.

Course Objectives: The candidates will understand the cell organization, bacterial growth and control, bacterial systematic and classification of viruses.

Course Outcome

At the end of the course, learners will be able to:

CO1: Get a wide knowledge on gram positive, gram negative organisms and archeal groups.

CO2: Have a wide knowledge on cultivation of microorganisms and selection by pure culture methods by learning different components of media and their types which include selective, differential, enriched, enrichment and defined media.

CO3: Have a thorough description on different isolation methods like streaking, dilution and plating techniques.

CO4: Gain a deep knowledge on taxonomy and types of classification systems.

CO5: Learn the different groups like archea which can adapt to drastic environments like methanogens, thermophiles and halophiles.

CO6: Assimilate knowledge on the properties of viral proteins, capsoids, size and structure of viruses.

CO7: Obtain knowledge on other viral proteins such as prions, viroids which cause infection.

CO8: Understand different cultivation methods of viruses like egg inoculation, cell lines and animal inoculation methods.

CO9: Gain knowledge of the mechanism of other viruses which cause infection on plants, bacteria (phages) and humans like T4, Tobacco Mosaic virus, Cauliflower Mosaic Virus HIV and hepatitis viruses.

UNIT I CELL ORGANIZATION 6

Cell size, shape and arrangements, capsule, flagella and pili, Composition and detailed structure of gram-positive and gram-negative cell wall and archaeal cell wall structure.

Unit II BACTERIAL GROWTH AND CONTROL 6

Culture media: Components of media, Synthetic or defined media, Complex media, enriched media, selective media, differential media, enrichment culture media. Pure culture isolation: Streaking, serial dilution and plating methods.

11. Cann AJ, Principles of Molecular Virology, Academic Press Oxford UK. 2012.

15BMI153

Microbial Metabolism (Theory)

2002

Course Objectives: The candidates will understand the microbial growth, nutrient uptake and transport, chemoheterotrophic metabolism, anaerobic respiration and fermentation, chemolithotrophic and phototrophic metabolism.

Course Outcome

At the end of the course, learners will be able to:

CO1: Gain knowledge about the microbial growth and nutritional categories of microorganisms.

CO2: Understand various nutritional uptake and transport mechanism.

CO3: Learn about the chemo heterotrophic metabolism and types of respiration and fermentation.

CO4: Learn anaerobic respiration and types of fermentation

CO5: Understand chemolithotrophic and phototrophic metabolismism

CO6: Gain knowledge on biological nitrogen fixation.

UNIT I MICROBIAL GROWTH

6

Definitions of growth, Batch culture, Continuous culture, generation time and specific growth rate. Temperature and temperature ranges of growth - pH and pH ranges of growth; Effect of solute and water activity on growth; Effect of oxygen concentration on growth. Nutritional categories of microorganisms

UNIT II NUTRIENT UPTAKE AND TRANSPORT

6

Passive and facilitated diffusion; Primary and secondary active transport, concept of uniport, symport and antiport; Group translocation; Iron uptake

UNIT III CHEMOHETEROTROPHIC METABOLISM

6

Concept of aerobic respiration, anaerobic respiration and fermentation. Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, TCA cycle

UNIT IV ANAEROBIC RESPIRATION AND FERMENTATION

6

Anaerobic respiration,-Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction). Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways.

UNIT V CHEMOLITHOTROPHIC AND PHOTOTROPHIC METABOLISM 6

Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction). Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with REFERENCE BOOKS to photosynthesis in green bacteria and Cyanobacteria. Introduction to biological nitrogen fixation - Ammonia assimilation; Assimilatory nitrate reduction.

Total: 30hours

TEXTBOOK:

Ananthnarayanan. R & C. K. Jeyaram Panicker; TEXTBOOKS of Microbiology, Orient Longman. 2010.

REFERENCE BOOKS:

1. Madigan MT, and Martinko JM, Brock Biology of Microorganisms. Prentice Hall International Inc.14th edition. 2014.
2. Moat AG and Foster JW., Microbial Physiology. John Wiley & Sons. 4th edition.2002.
3. Reddy SR and Reddy SM., Microbial Physiology. Scientific Publishers India. 2005.
4. Gottschalk G., Bacterial Metabolism. Springer Verlag. 2nd edition. 1986.
5. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR., General Microbiology. McMillan Press. 5th edition, 1987.
6. Willey JM, Sherwood LM, and Woolverton CJ., Prescott's Microbiology. McGraw Hill Higher Education. 9th edition. 2013.

15BMI154

Industrial and Food Microbiology (Theory)

2002

Course Objectives: The candidates will understand the development of food microbiology, microbial fermentation processes, food preservation and food-borne diseases.

Course Outcome

At the end of the course, learners will be able to:

CO1: Realize the importance of microbes in the production of many useful products

CO2: Understand fermenters and fermentation processes.

CO3: Gain knowledge in downstream processing and industrial production of various products.

CO4: Understand the relationship between foods and microbes and its impact on human health

CO5: Assimilate information on Microbial production of foods and food sanitation

UNIT I INTRODUCTION 6

Brief history and developments in industrial microbiology. Types of fermentation processes - solid state, liquid state, batch, fed-batch and continuous. Types of fermenters – laboratory, pilot-scale and production fermenters.

UNIT II MICROBIAL FERMENTATION PROCESSES 6

Ingredients used in fermentation medium - molasses, corn steep liquor, whey & Yeast extract. Downstream processing - filtration, centrifugation, cell disruption, solvent extraction. Microbial production of industrial products - citric acid, ethanol and penicillin. Industrial production and uses of the enzymes - amylases, proteases, lipases and cellulases

UNIT III FOOD AS A SUBSTRATE FOR MICROBIAL GROWTH 6

Intrinsic and extrinsic parameters that affect microbial growth in food. Microbial spoilage of food – seafoods, fruits and vegetables, milk, egg, bread and canned foods

UNIT IV PRINCIPLES AND METHODS OF FOOD PRESERVATION 6

Physical methods - high temperature, low temperature, irradiation, aseptic packaging
Chemical methods - salt, sugar, benzoates, citric acid, ethylene oxide, nitrate and nitrite.
Food sanitation and control – HACCP

UNIT V DAIRY PRODUCTS, PROBIOTICS AND FOOD-BORNE DISEASES 6

Fermented dairy products - yogurt, acidophilus milk, kefir, dahi and cheese. Probiotics definition, examples and benefits Food intoxication by *Clostridium botulinum* and *Staphylococcus aureus*, Food infection by *Salmonella* and *E.coli*.

Total: 30hours

TEXTBOOK:

Frazier WC and Westhoff DC., Food Microbiology. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India. 3rd edition. 1992.

REFERENCE BOOKS:

1. Crueger W and Crueger A., Biotechnology: A TEXTBOOKS of Industrial Microbiology. Panima Publishing Company, New Delhi. 2nd Edition. 2000.
2. Patel AH., Industrial Microbiology . MacMillan India Limited Publishing Company Ltd. New Delhi, India. 1996.
3. Tortora GJ, Funke BR, and Case CL., Microbiology: An introduction. Pearson Education. 9th Edition. 2008.
4. Willey JM, Sherwood LM AND Woolverton CJ, Prescott, Harley and Klein's Microbiology. McGraw Hill Higher education. 9th Edition. 2013.
5. Casida LE., Industrial Microbiology. Wiley Eastern Limited. 1991.
6. Stanbury PF, Whitaker A and Hall SJ., Principles of Fermentation Technology. Elsevier Science Ltd. 2nd edition, 2006.
7. Adams MR and Moss MO., Food Microbiology; New Age International (P) Limited Publishers, New Delhi, India. . 4th edition, 1995.
8. Banwart JM. Basic Food Microbiology. CBS Publishers and Distributors, Delhi, India. 1987.
9. Jay JM, Loessner MJ and Golden DA., Modern Food Microbiology. CBS Publishers and Distributors, Delhi, India. 7th edition, 2005.

15BMI155

Microbes in Environment (Theory)

2 0 0 2

Course Objectives: The candidates will understand the microorganisms and their habitats, microbial interactions, biogeochemical cycling and waste management.

Course Outcome

At the end of the course, learners will be able to:

CO1: Learn about the structure and functions of ecosystem.

CO2: Gain knowledge on ecological role of microbes in the environment.

CO3: Assimilate information on microbial communities in the environment.

CO4: Obtain knowledge about microbial interactions – symbiosis, antagonism, synergism, commensalism, amensalism, parasitism, and predation.

CO5: Have information on micro- animal interaction.

CO6: Gain knowledge in the importance of biogeochemical cycling in the ecosystems.

CO7: Obtain knowledge on microbiological aspects and management of waste water.

CO8: Learn about the microbial bioremediation of pesticides, hydrocarbons, oil spills.

UNIT I MICROORGANISMS AND THEIR HABITATS

6

Structure and function of ecosystems. Terrestrial Environment: Soil profile and soil microflora. Aquatic Environment: Microflora of fresh water and marine habitats

Atmosphere: Aeromicroflora and dispersal of microbes.

3. Maier RM, Pepper IL and Gerba CP., Environmental Microbiology. Academic Press. 2nd edition, 2009.
4. Okafor, N, Environmental Microbiology of Aquatic & Waste systems. Springer, New York. 2011.
5. Singh A, Kuhad, RC & Ward OP, Advances in Applied Bioremediation. Volume 17, Springer-Verlag, Berlin Hedeilberg. 2009.
6. Barton LL & Northup DE, Microbial Ecology. Wiley Blackwell, USA2011.

15BMI156 Medical Microbiology and Immunology (Theory) 2 0 0 2

Course Objectives: The candidates will understand the concepts of normal flora organisms microbial diseases, antimicrobial agents and immune cells, and immune response and immunological disorders.

Course Outcome

At the end of the course, learners will be able to:

CO1: Realize the importance of normal microbial flora in human health

CO2: Study normal microbiota of different organs in human body.

CO3: Assimilate knowledge on microbial diseases affecting various organ systems.

CO4: Understand the mechanisms of mode of action of different class of antibiotics

CO5: Realize the role of immune cells in developing immunity against microbial diseases

CO6: Assimilate information on significant role of immune organs

CO7: Understand the vital role of antibodies and their development

CO8: Realize the development of HMI and CMI

CO9: Comprehend importance of immunological disorders.

UNIT I NORMAL MICROFLORA AND SAMPLE COLLECTION 6

Normal microflora of the human body: Importance of normal microflora, normal microflora of skin, throat, gastrointestinal tract, urogenital tract. Host pathogen interaction: Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity.

UNIT II MICROBIAL DISEASES 6

List of diseases of various organ systems and their causative agents. List of diseases of various organ systems and their causative agents. List of diseases of various organ systems and their causative agents. Brief description of various types of mycoses.

Course Objectives: The candidates will understand the development genetic engineering, vectors, DNA amplification and DNA sequencing, application of genetic engineering and biotechnology.

Course Outcome

At the end of the course, learners will be able to:

CO1: Gain knowledge about the basics in genetic engineering.

CO2: Learn about the various strategies of DNA RNA and Protein analysis.

CO3: Study about the various types of cloning vectors used in genetic engineering.

CO4: Learn about the DNA amplification and sequencing methods.

CO5: Acquire knowledge in gene transfer methods and also the applications of biotechnology.

CO6: Assimilate knowledge about the techniques used to characterize the nanoparticles.

CO7: Learn about the protein engineering.

CO8: Achieve knowledge about the intellectual property rights, patent, copyrights and Trademarks

UNIT I INTRODUCTION TO GENETIC ENGINEERING 6

Milestones in genetic engineering and biotechnology. Restriction modification systems: Mode of action, applications of Type II restriction enzymes in genetic engineering. DNA modifying enzymes and their applications: DNA polymerases.

UNIT II VECTORS 6

Cloning Vectors: Definition and Properties - Plasmid vectors: pBR and pUC series Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs. Expression vectors: *E.coli* lac and T7 promoter-based vectors, yeast YIp, YEp and YCp vectors, Baculovirus based vectors, mammalian SV40-based expression vectors.

UNIT III DNA AMPLIFICATION AND DNA SEQUENCING 6

PCR: Basics of PCR, RT-PCR, Real-Time PCR, Genomic and cDNA libraries: Preparation and uses, Genome sequencing - Sanger's method of DNA Sequencing: traditional and automated sequencing

UNIT IV APPLICATION OF GENETIC ENGINEERING 8

Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral mediated delivery, *Agrobacterium* - mediated delivery. Products of recombinant DNA technology: Products of human therapeutic interest - insulin, hGH, antisense molecules. Bt transgenic - cotton, brinjal, flavo savo tomato, Gene therapy, recombinant vaccine, protein engineering

UNIT V INTELLECTUAL PROPERTY RIGHTS 4

Patents, Copyrights, Trademarks.

Total: 30hours

TEXTBOOK:

Primrose SB and Twyman RM. Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K. 2008.

REFERENCE BOOKS:

1. Brown TA., Gene Cloning and DNA Analysis Blackwell Publishing, Oxford, U.K. 6th edition. 2010.
2. Clark DP and Pasternik NJ. Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA. 2009.
3. Primrose SB and Twyman RM., Principles of Gene Manipulation and Genomics, Blackwell Publishing, Oxford, U.K. 7th edition. 2006.
4. Brown TA., Genomes-3. Garland Science Publishers. 2007.

15BMI158 Microbial Genetics and Molecular Biology (Theory) 2002

Course Objectives: The candidates will understand the structures of DNA and RNA, replication of DNA and transcription, translation, gene regulation, mutations and genetic exchange.

Course Outcome

At the end of the course, learners will be able to:

- CO1:** Attain knowledge about the basics in structure of Nucleic acid.
- CO2:** Learn about the organization of genetic materials in organisms.
- CO3:** Study about the various types of cloning vectors used in genetic engineering.
- CO4:** Know about the mechanisms DNA replication, transcription and translation processes in organisms.

TEXTBOOK:

Russell PJ. Genetics- A Molecular Approach. Benjamin Cummings.3rd Ed, 2009.

REFERENCE BOOKS:

1. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R, Molecular Biology of the Gene, Cold Spring Harbour Lab. Press, Pearson Publication. 6th edition, 2008.
2. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP, The World of the Cell, Pearson Benjamin Cummings Publishing, San Francisco. 7th edition, 2009.
3. De Robertis EDP and De Robertis EMFCell and Molecular Biology, Lippincott Williams and Wilkins, Philadelphia. 8th edition, 2006.
4. Karp G, Cell and Molecular Biology: Concepts and Experiments, John Wiley & Sons. Inc. 6th edition, 2010.
5. Krebs J, Goldstein E, Kilpatrick S (2013). Lewin's Essential Genes, Jones and Bartlett Learning
6. Gardner EJ, Simmons MJ, Snustad DP, Principles of Genetics. 8th Ed. Wiley-India. 3rd Ed., 2008.
7. Klug WS, Cummings MR, Spencer, C, Palladino, M, Concepts of Genetics, Benjamin Cummings. 10th Ed., 2011.

List of Ability Enhancement Compulsory Courses**5 0 0 4****AECC 1: 15LTA001 - தமிழ் மொழி, இலக்கிய வரலாறு – அறிமுகம்****15LHN001 - HINDI I****15LFR001 - FRENCH I****15LEN001- ENGLISH I****AECC 2: 15LTA002 - தமிழிலக்கியம்****15LHN002 - HINDI II****15LFR002- FRENCH II****15LEN002 –ENGLISH II****AECC 3: 15LTA003 - பயன்பாட்டுத் தமிழ்****15LHN003 - HINDI III****15LFR003 - FRENCH III****15LEN003- ENGLISH III****AECC 4: 15LTA004 - தமிழர் நாகரிகமும் பண்பாடும்****15LHN004 - HINDI IV****15LFR004 - FRENCH IV****15LEN004-ENGLISH IV****AECC 5: 15ENS201 - Environmental Science**

15LTA001 - தமிழ் மொழி, இலக்கிய வரலாறு – அறிமுகம் - 5 0 0 4

நோக்கம்: தமிழ்மொழி மற்றும் இலக்கியத்தின் வரலாற்றை அறிமுகம் செய்யும் நோக்கில் இப்பாடம் வடிவமைக்கப்பட்டுள்ளது. தமிழ்மொழியின் வரலாற்றை அறிவியல் கண்ணோட்டத்துடனும் மொழிக்குடும்பங்களின் அடிப்படையிலும் விளக்குகிறது. சங்க இலக்கியம் தொடங்கி, இக்கால இலக்கியம் வரையிலான தமிழிலக்கிய வரலாற்றை இலக்கிய வரலாறு அறிமுகப்படுத்துகின்றது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

அலகு 1 தமிழ் மொழி வரலாறு

15

மொழிக்குடும்பம் - இந்திய மொழிக்குடும்பங்கள் - இந்திய ஆட்சி மொழிகள் - திராவிட மொழிக்குடும்பங்கள் - திராவிட மொழிகளின் வகைகள் - திராவிட மொழிகளின் சிறப்புகள் - திராவிட மொழிகளின் வழங்கிடங்கள் - திராவிட மொழிகளுள் தமிழின் இடம் - தமிழ்மொழியின் சிறப்புகள் - தமிழ் பிறமொழித் தொடர்புகள்.

அலகு 2 சங்க இலக்கியம்

15

சங்க இலக்கியம் - எட்டுத்தொகை - நற்றிணை - குறுந்தொகை - ஐங்குறுநூறு - பதிற்றுப்பத்து - பரிபாடல் - கலித்தொகை - அகநானூறு - புறநானூறு - பத்துப்பாட்டு - திருமுருகாற்றுப்படை - சிறுபாணாற்றுப்படை - பெரும்பாணாற்றுப்படை - பொருநராற்றுப்படை - மலைபடுகடாம் - குறிஞ்சிப்பாட்டு, முல்லைப்பாட்டு, பட்டினப்பாலை - நெடுநல்வாடை - மதுரைக்காஞ்சி.

அலகு 3 அற இலக்கியங்களும் காப்பியங்களும்

15

களப்பிரர் காலம் விளக்கம் - நீதி இலக்கியத்தின் சமூகத்தேவை - பதினெண்கீழ்க்கணக்கு நூல்கள் அறிமுகம் - திருக்குறள், நாலடியார். காப்பியங்கள் - ஐம்பெருங்காப்பியங்கள் மற்றும் ஐஞ்சிறுங்காப்பியங்கள் அறிமுகம் - காப்பிய இலக்கணம் - சிலப்பதிகாரம் - மணிமேகலை - சீவகசிந்தாமணி - வளையாபதி - குண்டலகேசி.

தமிழகப் பக்தி இயக்கங்கள் - பக்தி இலக்கியங்கள் - சைவ இலக்கியம் - நாயன்மார்கள் அறுபத்து மூவர் - சமயக்குரவர் நால்வர் - வைணவ இலக்கியம் - பன்னிரு ஆழ்வார்கள் - முதல் மூன்று ஆழ்வார்கள்.

சிற்றிலக்கியக் காலம் - சிற்றிலக்கியங்கள் - வகைகள் - பரணி - கலிங்கத்துப்பரணி - குறவஞ்சி - குற்றாலக் குறவஞ்சி - பிள்ளைத்தமிழ் - மீனாட்சியம்மைப் பிள்ளைத்தமிழ் - தூது - தமிழ்விடு தூது - கலம்பகம் - நந்திக்கலம்பகம் - பள்ளு - முக்கூடற்பள்ளு.

அலகு 5 இக்கால இலக்கியங்கள்

நவீன காலம் - நவீன இலக்கியம் - உள்ளடக்கம் - புதுக்கவிதை - தோற்றமும் வளர்ச்சியும்- நாவல் - முதல் மூன்று நாவல்கள் - நாவலின் வகைகள் - பொழுது போக்கு நாவல்கள் - வரலாற்று நாவல்கள் - சமூக நாவல்கள் - இக்கால நாவல்கள் - மொழிபெயர்ப்பு நாவல்கள் - சிறுகதை -வகைகளும் வளர்ச்சியும் - நாடகம் - காலந்தோறும் நாடகங்கள் - புராண இதிகாச நாடகங்கள் - சமூக நாடகங்கள் - வரலாற்று நாடகங்கள் - மொழிபெயர்ப்பு நாடகங்கள் - நகைச்சுவை நாடகங்கள்.

மொத்தம்: 75 மணி நேரம்

பார்வை நூல்கள்:

1. அகத்தியலிங்கம். ச., “திராவிடமொழிகள் தொகுதி 1”, மணிவாசகர் பதிப்பகம், முதற்பதிப்பு, 1978.
2. சக்திவேல். ச., “தமிழ்மொழி வரலாறு”, மணிவாசகர் பதிப்பகம், முதற்பதிப்பு 1998.
3. பூவண்ணன், “ தமிழ் இலக்கிய வரலாறு”, சைவசித்தாந்த நூற்பதிப்புக் கழகம், முதற்பதிப்பு, 1998.
4. வரதராசன். மு., ”இலக்கிய வரலாறு”,சாகித்ய அகாதெமி, ஒன்பதாம் பதிப்பு, 1994.
5. விமலானந்தம். மது.ச., “இலக்கிய வரலாறு”, பாரி நிலையம், மறுபதிப்பு, 2008.

நோக்கம்: சங்க காலம் தொடங்கி தற்காலம் வரையிலும் தமிழில் உள்ள படைப்பிலக்கியங்களை இப்பாடம் அறிமுகம் செய்கின்றது. தமிழ் இலக்கியத்தில் தேர்ந்தெடுக்கப்பட்ட மிக முக்கியமான செய்யுட்கள், கவிதைகள், கதைகள், உரைநடை ஆகியவற்றைக்கொண்டு இப்பாடம் கட்டமைக்கப்பட்டுள்ளது. மாணாக்கரிடம் இலக்கியத் தேடலை உருவாக்குவதும், தற்சார்புடைய அறிவை மேம்படுத்துவதும் இப்பாடத்தின் நோக்கமாகும்.

அலகு 1 செவ்வியல் இலக்கியங்கள்

15

திருக்குறள்- அன்புடைமை, ஒழுக்கமுடைமை, பெரியாரைத்துணைக்கோடல் -மூன்று அதிகாரங்கள் முழுமையும்.

புறநானூறு- பாடல் எண்: 18, 55, 182, 183, 192 -ஐந்து பாடல்கள்.

குறுந்தொகை- பாடல் எண்: 2, 167, 27, 202, 184 - ஐந்து பாடல்கள்.

அலகு 2 காப்பியங்கள்

16

சிலப்பதிகாரம்- கனாத்திறம் உரைத்தக் காதை முழுவதும்.

மணிமேகலை- பவத்திறம் அறுக எனப் பாவை நோற்ற காதை முழுவதும்.

கம்பராமாயணம் - மந்தரைச் சூழ்ச்சிப்படலம் (தேர்ந்தெடுக்கப்பட்ட ஒன்பது பாடல்கள்).

அலகு 3 கவிதையும் புதுக்கவிதையும்

14

பாரதிதாசனின் 'தமிழியக்கம்' -(i) நெஞ்சு பதைக்கும் நிலை - (ii) இருப்பதைவிட இறப்பது நன்று - இரண்டு கவிதைகள்.

ஈரோடு தமிழன்பனின், "அந்த நந்தனை எரித்த நெருப்பின் மிச்சம்" என்னும் தொகுதியில் இடம்பெற்றுள்ள 'விடிகிறது' என்னும் புதுக்கவிதை.

அலகு 4 சிறுகதைகள்

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தி. ஜானகிராமனின் 'சக்தி வைத்தியம்'

கி. ராஜநாராயணனின் 'கதவு' - இரண்டு கதைகள்

வைரமுத்து எழுதிய 'சிற்பியே உன்னைச் செதுக்குகிறேன்' முழுவதும்

மொத்தம்: 75 மணி நேரம்

பாட நூல்கள்:

1. இரவிச்சந்திரன். சு. (ப.ஆ), "செய்யுள் திரட்டு", வேல்ஸ் பல்கலைக்கழகம், முதற்பதிப்பு, 2008.
2. வைரமுத்து. இரா., "சிற்பியே உன்னைச் செதுக்குகிறேன்", திருமகள் நிலையம், பதினேழாம் பதிப்பு, 2007.

பார்வை நூல்கள்:

1. பாலச்சந்திரன்.சு., "இலக்கியத் திறனாய்வு", நியூ செஞ்சுரி புக் ஹவுஸ், பத்தாம் பதிப்பு, 2007.
2. மாதையன்.பெ., "தமிழ்ச் செவ்வியல் படைப்புகள்", நியூ செஞ்சுரி புக் ஹவுஸ், முதல் பதிப்பு, 2009.
3. வரதராசன்.மு., "குறள் காட்டும் காதலர்", பாரி நிலையம், மறுபதிப்பு, 2005.

15LTA003

பயன்பாட்டுத் தமிழ்

5 0 0 4

நோக்கம்: தற்கால அன்றாடத்தேவைக்குரிய வகையில் தமிழ்மொழியைச் செம்மையாகப் பயன்படுத்த வேண்டும் என்னும் நோக்கில் இப்பாடம் உருவாக்கப்பட்டுள்ளது. மாணாக்கரின் வேலைவாய்ப்பு நேர்காணல்கள் மற்றும் குழு உரையாடல்களை எதிர்கொள்வதற்கேற்ற பேச்சுத்திறன் மேம்பாடு, செய்தித்தாள்களை நுட்பமாக அணுகும்விதம், சிறந்த கடிதங்களை எழுதுவதற்கான பயிற்சி போன்ற பயன்பாடு சார்ந்த மொழிப்பயிற்சியை இப்பாடம் அளிக்கின்றது.

அலகு 1 மொழி

14

பிழை நீக்கி எழுதுதல் - ஒற்றுப்பிழை நீக்கி எழுதுதல் - தொடர்பிழை நீக்கி எழுதுதல் - ஒற்று மிகும் இடங்கள் - ஒற்று மிகா இடங்கள் - பிற மொழிச் சொற்களை நீக்கி எழுதுதல் - பயிற்சிகள்.

அலகு 2 பேச்சு

16

பேச்சுத்திறன் - விளக்கம் - பேச்சுத்திறனின் அடிப்படைகள் - வகைகள் - மேடைப்பேச்சு - உரையாடல் - குழுவாக உரையாடல் - பயிற்சிகள்.

தலைவர்களின் மேடைப் பேச்சுகள் - பெரியார் - அண்ணா - கலைஞர்.

அலகு 3 எழுதுதிறன்

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கலைச்சொல்லாக்கம் - தேவைகள் - கலைச்சொற்களின் பண்புகள் - கலைச்சொல்லாக்கத்தில் தவிர்க்க வேண்டியவை - அறிவியல் கலைச்சொற்கள்.

கடிதம் - வகைகள் - அலுவலகக் கடிதங்கள் - பயிற்சி - அறிஞர்களின் கடிதங்கள் - கடிதங்களின் வழி கற்பித்தல் - சில அறிஞர்களின் கடிதங்கள் - நேரு...,

அலகு 4 மொழிபெயர்ப்பு

16

மொழிபெயர்ப்பு அடிப்படைக் கோட்பாடுகள் - மொழிபெயர்ப்பு முறைகள் - மொழிபெயர்ப்பாளரின் தகுதிகள். மொழிபெயர்ப்பு வகைகள் - சொல்லுக்குச் சொல் மொழிபெயர்த்தல் - தழுவல் - கட்டற்ற மொழிபெயர்ப்பு - மொழியாக்கப்படைப்பு - இயந்திர மொழிபெயர்ப்பு - கருத்துப்பெயர்ப்பு - மொழிபெயர்ப்பு நடை - மொழிபெயர்ப்பு சிக்கல்களும் தீர்வுகளும்.

பயிற்சி: அலுவலகக் கடிதங்களை மொழிபெயர்த்தல் (ஆங்கிலத்திலிருந்து தமிழுக்கு).

அலகு 5 இதழியல் பயிற்சி

14

இதழ்களுக்குத் தலையங்கம் எழுதுதல் - நூல் மதிப்புரை எழுதுதல் - சாதனையாளரை நேர்காணல் - நிகழ்ச்சியைச் செய்தியாக மாற்றுதல்.

மொத்தம்: 75 மணி நேரம்

பார்வை நூல்கள்:

1. ஈஸ்வரன்.ச., சபாபதி.இரா., “இதழியல்”, பாவை பப்ளிகேஷன்ஸ், முதற்பதிப்பு, 2004.
2. ஈஸ்வரன்.ச., “மொழிபெயர்ப்பியல்”, பாவை பப்ளிகேஷன்ஸ், முதற்பதிப்பு, 2005.
3. எட்கர் தார்ப், ஷோவிக் தார்ப், “நேர்முகத் தேர்வில் வெற்றிபெற”, கிழக்குப் பதிப்பகம், இரண்டாம் பதிப்பு, 2009.

4. சுப்பிரமணியன்.பா.ரா., ஞானசுந்தரம்.வ., (ப.ஆ)“தமிழ்நடைக் கையேடு”, இந்தியமொழிகளின் நடுவண் நிறுவனம், மைசூர் மொழி அறக்கட்டளை மற்றும் தஞ்சைத்தமிழ்ப் பல்கலைக்கழகம் - வெளியீடு, நான்காம் மீள்பதிப்பு, 2010.

5. சுப்புரெட்டியார்.ந., “தமிழ் பயிற்றும் முறை”, மெய்யப்பன் பதிப்பகம், ஐந்தாம் பதிப்பு, 2006.

15LTA004

தமிழர் நாகரிகமும் பண்பாடும்

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நோக்கம்: பண்டைத் தமிழரின் வாழ்வியல் நெறிகள் இயல்பானதும் இயற்கையோடு இணங்கிச் செல்வதுமாகும்; மிகவும் பழமையானதும் பண்பட்டதுமாகும். அன்பான அக வாழ்க்கையைக்கூட செம்மையாகத் திட்டமிட்டுள்ளனர். பொழுதுபோக்கு, போர்முறைகள், கலை, சமயம், அரசியல், அறிவியல் என அனைத்திலும் தமிழர் சிறந்து விளங்குவதை விளக்கும் பாடமாக இது அமைந்துள்ளது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

அலகு 1 நாகரிகம், பண்பாடு

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சொற்பொருள் விளக்கம் - பண்டைத் தமிழர் வாழ்வியல் - அகம் - களவு - கற்பு - குடும்பம் - விருந்தோம்பல் - உறவு முறைகள் - சடங்குகள் - நம்பிக்கைகள் - பொழுதுபோக்கு - புறம் - போர் முறைகள் - நடுகல் வழிபாடு - கொடைப்பண்பு.

அலகு 2 கலைகள்

15

சிற்பம் - ஓவியம் - இசை - கூத்து - ஒப்பனை - ஆடை அணிகலன்கள்.

அலகு 3 சமயம்

15

சைவம் - வைணவம் - சமணம், பௌத்தம் வெளிப்படுத்தும் பண்பாடு.

அலகு 4 அரசியல்

15

அரசு அமைப்பு - ஆட்சி முறை - உள்நாட்டு வணிகம் - வெளிநாட்டு வணிகம் - வரி வகைகள் - நாணயங்கள் - நீதி முறை.

அலகு 5 அறிவியல்

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கல்வி - வேளாண்மை - வானியல் அறிவு - மருத்துவம் - கட்டிடக்கலை.

மொத்தம்: 75 மணி நேரம்

பார்வை நூல்கள்:

1. கே.கே. பிள்ளை, “தமிழக வரலாறு: மக்களும் பண்பாடும்”, உலகத் தமிழாராய்ச்சி நிறுவனம், மீள்பதிப்பு, 2009.
2. பக்தவச்சல பாரதி, “தமிழர் மானிடவியல்”, அடையாளம், இரண்டாம் பதிப்பு, 2008.
3. தட்சிணாமூர்த்தி. அ., “தமிழர் நாகரிகமும் பண்பாடும்”, யாழ் வெளியீடு, மறுபதிப்பு, 2011.
4. தேவநேயப்பாவாணர். ஞா., “பழந்தமிழர் நாகரிகமும் பண்பாடும்”, தமிழ்மண் பதிப்பகம், சென்னை.
5. வானமாமலை.நா., “தமிழர் வரலாறும் பண்பாடும்”, நியூ செஞ்சுரி புக் ஹவுஸ், ஆறாம் பதிப்பு, 2007.

15LHN001

HINDI I

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Course Objective: To train the students in the use of Karyalayin Basha. To enable the students to develop the communication skill in Hindi language.

Unit I GADYA AUR KARYALAYIN BASHA

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Mamata, -Yogyatha evam vyavasay kaa Chunaav Paribashik shabdavalil prashasanik vakyansh, padanam

Unit II GADYA AUR SARKARI PATRA

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Rajneethi kaa Bhandwara, , Samanya sarkari patra, gyapan, karyalay gyapan

Unit III GADYA AUR SARKARI PATRA

15

Computer nayi krantee kee dastak, , Karyalay aadesh, Ardha sarkari patra paripatra, Adhisoochana

Unit IV : GADYA AUR SAMANYA PATRA

15

Raspriya, Samanya patra- chutti patra,sampadak ke naam patra, shikayati patra,
pustak vikretha ke naam patra

Unit V: VYAVASAAYIK PATRA

15

Bankon mein bach khaata kholne ke liye – chek buk ke liye, run lene hetu, chek buk
gum ho jane hetu, kitaabon kaa krayadesh

Total : 75hours

TEXT BOOK:

Gadya Aur Prayojanmulak Hindi ed by Dr.N.Lavanya Mayura Publishers, 2008.

15LHN002

HINDI II

5 0 0 4

Course Objective: To enable the students to have the knowledge in contemporary literature of the modern era. It also provides an idea how translation to be effected.

UNIT I

KAHANI AUR EKANKI

15

Poos Kee Raat., - **Duzhazar**

UNIT II

EKANKI AUR KAHANI

15

.Vaapasi, Akeli, . Akbhari vigyapan

UNIT III :

KAHANI AUR ANUVAD

15

Sharandatha - Anuvad anuched angreji se hindi me karne ke liye.

UNIT IV

EKANKI AUR ANUVAD

15

Raat ke Raahi Main Bhi Maanav hoon Anuvad anuched angreji se hindi me karne ke liye.

UNIT V

KAHANI ,EKANKI AUR ANUVAD

15

Parda - Yeh Meri Janma Bhoomi Hai -anuvad anuched angreji se hindi me karne ke liye.

Total: 75hours

TEXT BOOK:

Sankalan Kahani evam Ekankied by Dr.N.Lavanya, Mayura Publishers, 2010.

Course Objective: To help the students to have in depth knowledge of Literature. It makes the students to acquire more about the medieval period through the literary works.

UNIT I PRACHIN KAVYA HINDI SAHITYA KA ITIHAS 15

Kabir- Hindi bash aka vikas – Hindi sahitya kaa aavirbahv

UNIT II PRACHIN KAVYA HINDI SAHITYA KA ITIHAS 15

Surdaas, Tulsidass. Hindi sahitya kaa kaal vibhajan, aadikal, kaa Parichay

UNIT III PRACHIN KAVYA HINDI SAHITYA KA ITIHAS 15

Rahim, aadikaal kaa namkran, paristhitiyan, racha evam rachnaakar

UNIT IV BHAKTI KAAL, REETHI KAA 15

Bhakti kal kaa vibhajan paristhitiyan- racha evam rachnaakar - Reethikal ke prakaar, rachna evam rachnakar

UNIT V PRACHIN KAVYA EVAM RACHNAKARON KAA PARICHAY 15

Bihari - Chandbardayee, Ameerkhusaro, Kabir, Surdas, Tulsidas Jaayasi, Kesahv das Bhushan,

Total: 75hours

TEXT BOOK:

Prachin evam Aadhunik Kavya Sankalan ed by Dr.N.Lavanya, Mayura Publishers, 2011.

REFERENCE BOOK:

Hindi Sahitya kaa Itihas, By Dr.Nagendra, Raj kamal Prakashan, 1997.

Course Objective: To enable the students to acquire knowledge in journalism so as to enhance his skill in effective communication pertaining to Hindi language.

UNIT I AADHUNIK KAVITHA AUR RACHNAAKAR 15

Mythili Sharan Gupt - Apna Sansar, Aadhunik Rachnakar Hazaari prasad Diwedi,

Mahaveer Prasad Diwedi,

Unit II AADHUNIK KAVITHA AUR RACHNAAKAR 15

Jayashankar Prasad Kamayani - Chinta, Aadhunik Hindi Rachanakar Premchand, Jainendra

Unit III AADHUNIK KAVITHA AUR PATRAKARITHA 15

Mahadeviverma, Murjaya PhoolBhavani Prasad Mishra Patrakarita – paribhasha,, arth, prakar, swaroop

Unit IV AADHUNIK KAVITHA , PATRAKARITHA AUR RACHNAKAR 15

Mukthibodh Tum Logoan se door,Shamsher Bhadur Singh – Bharat kee aarathi,

Vigyapan- sampadan kala,-Nirala, -Pant- Mohan Rakesh

Unit V AADHUNIK KAVITHA , PATRAKARITHA AUR RACHNAKAR 15

Prabhakar Machve Nimna Mdhya varg, **Patrakaritha-** samachar sankalan - Peeth patrakarita, Rachnakaar - Fanishwaranath renu -Mannu bhandari,Bhagawaticharan Verma, Yashpal

Total: 75hours

TEXT BOOK:

Prachin evam Aadhunik Kavya Sankalan ed by Dr.N.Lavanya, Mayura Publishers, 2011.

REFERENCE BOOK:

Patrakaritha Ek Paricahy by Dr.Madhu Dhawan, Bodh Prakashan,1997.

Course Objective: To introduce French Language. To enable the students to understand and to acquire the basic knowledge of French Language with the elementary grammar.

UNIT I INTRODUCTION 15

Introduction - Alphabet – Comment prononcer, écrire et lire les mots- Base : Les prénoms personnel de 1^{er}, 2^{ème} et 3^{ème} personnes – Conjugaisons les verbes être et avoir en forme affirmative, négative et interrogative

UNIT II LEÇONS 1-3 15

Leçons 1. Premiers mots en français,- 2. Les hommes sont difficiles,- 3 Vive la liberté- Réponses aux questions tirés de la leçon - Grammaire : Les adjectives masculines ou féminines – Les articles définis et indéfinis - Singuliers et pluriels

UNIT III LEÇONS 4-6 15

Leçons 4. L'heure, C'est l'heure,- 5. Elle va revoir sa Normandie,- 6 .Mettez –vous d'accord groupe de nom - Réponses aux questions tirés de la leçon - Grammaire : A placer et accorder l'adjectif en groupe de nom- Préposition de lieu –A écrire les nombres et l'heure en français

UNIT VI LEÇONS 7-9 15

Leçons 7. Trois visages de l'aventure,- 8. A moi, Auvergne,- 9. Recit de voyage - Réponses aux questions tirés de la leçon - Grammaire : Adjectif possessif – Les Phrases au Présent de l'indicatif - Les phrases avec les verbes pronominaux au présent

UNIT V COMPOSITION : 15

A écrire une lettre à un ami l'invitant à une célébration différente ex : mariage – A faire le dialogue - A lire le passage et répondre aux questions

Total: 75hours

TEXT BOOK :

Jacky GIRARDER & Jean Marie GRIDLIG, « Méthode de Français PANORAMA », Clé Internationale , Goyal Publication, New Delhi., Edition 2004

REFERENCE BOOKS:

1. Dondo Mathurin , “ Modern French Course”, Oxford University Press., New Delhi., Edition 1997
2. Nitya Vijayakumar, “Get Ready French Grammar – Elementary”, Goyal Publications, New Delhi., Edition 2010

Course Objective: To fortify the grammar and vocabulary skills of the students. Enable the students have an idea of the French Culture and Civilization

UNIT I LEÇONS 10 – 11 **15**

Leçons : 10. Les affaires marchent,- 11. Un après midi à problèmes- Réponses aux questions tirés de la leçon - Grammaire : Présent progressif, passé récent ou future proche - Complément d'objet directe - Complément d'objet indirecte.

UNIT II LEÇONS 12 – 13 **15**

Leçons : 12. Tout est bien qui fini bien,- 13. Aux armes citoyens – Réponses aux questions tirés de la leçon - Grammaire : Les pronoms « en ou y » rapporter des paroles - Les pronoms relatifs que, qui, ou où ,

UNIT III LEÇONS 14 – 15 **15**

Leçons 14. Qui ne risqué rien n'a rien,- 15. La fortune sourit aux audacieux – Réponses aux questions tirés de la leçon - Grammaire : Comparaison – Les phrases au passé composé

UNIT IV LEÇONS 16 – 18 **15**

Leçons 16 La publicite et nos rêves 17 La France le monde 18 Campagne publicitaire Réponses aux questions tirés de la leçon - Grammaire :- Les phrases à l' Imparfait - Les phrases au Future

UNIT V COMPOSITION : **15**

A écrire une lettre de regret// refus à un ami concernant l'invitation d'une célébration reçue- A écrire un essai sur un sujet générale - A lire le passage et répondre aux questions

Total: 75hours

TEXT BOOK :

Jacky GIRARDER & Jean Marie GRIDLIG, « Méthode de Français PANORAMA », Clé Internationale , Goyal Publication, New Delhi., Edition 2004

REFERENCE BOOKS:

1. Dondo Mathurin, “Modern French Course”, Oxford University Press, New Delhi., Edition 1997
2. Paul Chinnappane “Grammaire Française Facile”, Saraswathi House Pvt Ltd, New Delhi, Edition 2010

Objective :

To strengthen the Grammar and Composition in French language.

To train the students to enhance his skill in French language for communication

UNIT I LEÇON 16 & 29	12
La famille Vincent (Page 44) - Grammaire : Passé composé' Vers l'hôtel (page 80) Grammaire : Impératif, A mettre les phrases du singulier au pluriel	
UNIT II LEÇON 40 & 44	12
L'épicerie, les légumes et les fruits (page 112) – Grammaire : Présent de l'indicatif a poste (page 124) – l Grammaire : A mettre les phrases à l'imparfait	
UNIT III LEÇON 51 & 58	12
Le café et tabac (page 142) - Grammaire : A changer les phrases en Interrogatif La Chasse et la pêche (160) - Grammaire : Le plus que parfait	
UNIT IV LEÇON 61	12
Un mariage à la campagne(page 170) - Grammaire –A changer au participe présent	
UNIT V COMPOSITION	12
A écrire une lettre à un ami l'invitant à une celebration differente ex : mariage – A faire un essaie sur un sujet générale - A lire le passage et répondre aux questions	

TOTAL : 60 Hours

TEXTBOOK

Les leçons ont été choisi et tiré de I & II degré de G .MAUGER « Cours de
Langue et de Civilisation Française » The Millenium, Publication Hachette,
Edition 2002

REFERENCE BOOKS

- 1.DONDO Mathurin, “ Modern French Course”, Oxford University Press, New
Delhi., Edition 1997
2. Paul Chinnapan, « Saraswati Grammaire Française facile », Saraswathi House
Pvt. Ltd., New Delhi., Edition 2010
3. Larouse, “Larouse French Grammar”, Goyal Publication, New Delhi., Edition
1995

Objective:

To enable the students to strengthen their knowledge of grammar/composition

To make the students to develop their skills of communication in French language

UNIT I LEÇON 20 & 46**12**

Une grande Nouvelle (page 56) – Grammaire : A mettre les phrases au Future
Le métro ; l'autobus (page 130) - Grammaire : A former ou à changer
l'adjectif masculin ou féminin à l'adverbe - A trouver les noms qui
correspondent aux verbes.

UNIT II LEÇON 48 & 63**12**

A la Préfecture de police (page 132) - Grammaire : Les Pronoms relatifs
Les sports (page 174) Grammaire : Le conditionnel présent

UNIT III LEÇON 56 & 57**12**

A Biarritz, la plage (page 156) - Grammaire : Le future antérieure
Dans les Pyrénées (page 158) - Grammaire : Le future antérieure suite)

UNIT IV LEÇON 65**12**

A fin des vacances (page 178) Grammaire : A changer les phrases du pluriel
au singulier - Le présent du subjonctif

UNIT V COMPOSITION**12**

A écrire une lettre de regret / refus à un ami concernant l'invitation d'une
célébration

reçue- A écrire un essai sur un sujet générale - A lire le passage et répondre aux
questions

TOTAL : 60 Hours**TEXTBOOK**

Les leçons ont été choisis et tirés de I & II degré de G .MAUGER « Cours de
Langue et de Civilisation Française » The Millennium, Publication Hachette,
Edition 2002

REFERENCE BOOKS

1. DONDO Mathurin, " Modern French Course", Oxford University Press,
New Delhi., Edition 1997
2. Paul Chinnapan, « Saraswati Grammaire Française facile », Saraswathi
House Pvt. Ltd., New Delhi., Edition 2010
3. Larousse, "Larousse French Grammar", Goyal Publication, New Delhi.,
Edition

Course Objective: To enable the students to develop their communication skills effectively. To make students familiar with the English Language. To enrich vocabulary in English. To develop communicative competent

UNIT I	DETAILED POEMS I	15
	<ol style="list-style-type: none"> 1. On His Blindness - John Milton 2. The Village Schoolmaster - Oliver Goldsmith 3. The Daffodils - William Wordsworth 	
UNIT II	DETAILED POEMS II	15
	<ol style="list-style-type: none"> 4. Night and Death - Joseph Blanco White 5. The Ballad of Father Gilligan - W.B. Yeats 	
UNIT III	PROSE	15
	<ol style="list-style-type: none"> 1. Martin Luther King Jr. - Coretta s King 2. Albert Schweitzer - Norman Wymar 3. Stanley Finds Livingstone - Lawrence Wilson 4. Srinivasa Ramanujan - C.P. Snow 5. My Days - R.K. Narayan 	
UNIT IV	GRAMMAR	15
	<ol style="list-style-type: none"> 1. Articles 2. Prepositions 3. Tenses 4. Wh - Questions 5. Synonyms and Antonyms 6. One Word Substitution 	
UNIT V	COMPOSITION	15
	<ol style="list-style-type: none"> 1. Reading Comprehension 2. Filling up Forms 3. Railway Reservation/ Cancellation Forms 4. Bank-Chalan 5. Convocation Form 6. Money Order Form 	

Total : 75hours

TEXT BOOK:

Mahadevan, Usha. *Empower with English, Sun Beams - I*. Emerald Pub: Chennai. 2012. Print.

Course Objective: To enable the students to develop their communication skills effectively. To make students familiar with the English Language. To enrich vocabulary in English. To develop communicative competent

UNIT I	PROSE-I	15
	<ol style="list-style-type: none"> 1. On Saying 'Please' - A.G. Gardiner 2. Women, Not the Weaker Sex - M.K. Gandhi 3. The Sky is the Limit - Kalpana Chawla 	
UNIT II	PROSE-II	15
	<ol style="list-style-type: none"> 4. Polluting the World - Edgar I. Baker 5. Dimensions of Creativity - Dr. A. P. J. Abdul Kalam 6. The Message of Visva - Bharati 	
UNIT III	SHORT STORIES	15
	<ol style="list-style-type: none"> 1. Open Window - H. H. Munro (Saki) 2. The Lion's Share - Arnold Bennett 3. The Sparrows - K.A. Abbas 4. The Cop and The Anthem - O- Henry 5. The Necklace - Guyde Maupassant 	
UNIT IV	FUNDAMENTAL GRAMMAR SKILLS	15
	<ol style="list-style-type: none"> 1. Question Tags 2. Concord 3. Reported Speech 4. Idiom and Phrases 	
UNIT V	ADVANCED GRAMMAR SKILLS	15
	<ol style="list-style-type: none"> 1. Conditional Clauses 2. Cause and Effect 3. Simple, Complex, Compound 4. Framming Questions 	

Total : 75hours

TEXT BOOK:

Rao, Shoba B. *Empower with English, Sun Beams - II*. Emerald Pub: Chennai. 2012. Print.

Course Objectives: To train the students in the use of the english language in varied literary and non literary context. To teach them soft skills and strength their foundation in grammar and composition. To elevate their comprehension skills

UNIT I	PROSE I	15
	1. Spoon Feeding - W. R. Inge 2. Reading for Pleasure - L. A. G. Strong 3. The Challenge of our Time - E. M. Forster	
UNIT II	PROSE II	15
	4. Human Values in Education - V. K. Gokak 5. Human Rights - Sivagami Paramasivam	
UNIT III	SHORT STORIES	15
	1. Comrades - Nanine Gordimer 2. Games at Twilight - Anita Desai 3. The Gateman's Gift - R.K. Narayan	
UNIT IV	PRIMARY COMPOSITION EXERCISES	15
	1. Letter Writing 2. Comprehension	
UNIT V	ADVANCEDCOMPOSITION EXERCISES	15
	1. Precis-Writing 2. Resume Writing 3. Report Writing	

Total : 75hours

TEXT BOOKS:

1. Subramanian, S. Dr. *Words of Wisdom*. An Anthology of Modern Prose. Anu Chitra Pub., Chennai. 2003. P.
2. Subramanian, A, E. *Gifts to Posterity*. An Anthology of Modern Short Stories. Anu Chitra Pub., Chennai. 2003. P

Unit 1 Multidisciplinary nature of environmental studies

Definition, scope and importance

(2)

Need for public awareness.

Unit 2 Natural Resources

(5)

Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

Unit 3 Ecosystems

(4)

• Concept of an ecosystem.

• Structure and function of an ecosystem.

• Producers, consumers and decomposers.

• Energy flow in the ecosystem.

• Ecological succession.

• Food chains, food webs and ecological pyramids.

• Introduction, types, characteristic features, structure and function of the following ecosystem:-

a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4 Biodiversity and its conservation

• Introduction – Definition: genetic, species and ecosystem diversity.

• Biogeographical classification of India

• Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values

• Biodiversity at global, National and local levels.

• India as a mega-diversity nation

• Hot-spots of biodiversity.

• Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

• Endangered and endemic species of India

• Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 5: Environmental Pollution (4)

Definition • Cause, effects and control measures of :- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Unit 6: Social Issues and the Environment (3)

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit 7 : Human Population and the Environment (3)

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit 8 : Field work (3)

- Visit to a local area to document environmental assetsriver/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

Total : 24 hours

Text Books

Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

Reference Books

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380

013, India,

2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

3. Clark R.S., Marine Pollution, Clanderson Press Oxford

List of Skill Enhancement Courses

2 0 0 2

SEC1: 15BPD251 - Personality Development I

SEC2: 15NSS255 - National Service Scheme I

SEC3: 15NSS256 - National Service Scheme II

SEC4: 15NSS257 - National Service Scheme III

SEC5: 15NSS258 - National Service Scheme IV

SEC6: 15NSS259 - National Service Scheme V

SEC7: 15NSS260 - National Service Scheme VI

15BPD251

Personality Development

2 0 0 2

Course Objective: To Make Aware About The Importance Of Personality And Development In The Business World. To Make The Students Follow The Good Personality And Create A Good Relationship With Others.

Course Outcome

At the end of the course, learners will be able to:

CO1: Realize importance of personality development.

CO2: Learn about the hurdles in achieving success

CO3: Understand the importance of failure.

CO4: Obtain information on positive and negative attitudes.

CO5: Understand the concept of motivation.

CO6: Learn the significance of self esteem and smartness.

CO7: Acquire information on body language, character building and team work.

CO8: Learn about the stress management.

UNIT I PERSONALITY DEVELOPMENT-INTRODUCTION

6

The Concept Personality - Dimensions of Personality - Term Personality Development - Significance. The Concept of Success And Failure What Is Success? - Hurdles In Achieving Success - Overcoming Hurdles - Factors Responsible For Success – What Is Failure - Causes Of Failure - Do's And Don'ts Regarding Success And Failure.

2. Communicate To Win - Richard Denny - Kogan Page India Private Limited, New Delhi-2009

3. Essentials Of Business Communication - Rajendra Pal And J. S. Korlhalli - Sultan Chand & Sons, New Delhi, 1st edition, 2012

REFERENCE BOOKS:

1) Business Communication - K. K. Sinha - Galgotia Publishing Company, New Delhi.-4th edition, 2012

2) Media And Communication Management - C. S. Rayudu - Himalaya Publishing House, Bombay. 2011

3) Business Communication - Dr. S.V. Kadvekar, Prin. Dr. C. N. Rawal And Prof. Ravindra Kothavade - Diamond Publications, Pune. 2009

4) You Can Win - Shiv Khera - Macmillan India Limited. 2012

5) Group Discussion And Public Speaking - K. Sankaran And Mahendra Kumar - M.I. Publications, Agra .2000

6) Basic Managerial Skills For All - Prentice-Hall Of India Pvt. Ltd., New Delhi-2011- E.H.mcgrath

7) 8 Habits - Stephen Covey-simon&schusker publisher-2007 edition.

8) Management Thoughts - Pramod Batra-HPB publisher-1st edition-2006

9) Produced By Prof. Rooshikumar Pandya - Creative Communication And Management Center, Bombay-R&E publisher kindle edition-2012.

A) Assertive Training: Four Cassettes-hannah Richards-2012

B) Self Hypnosis For Goal Achievement: Four Cassettes-kindle edition-ryan cooper-2012

15BBC101

ALLIED MICROBIOLOGY (For B.Sc. Biochemistry)

Course Objectives: The candidate will gain knowledge on contributions of scientists in microbiology. They will learn the structural organization of bacteria and fungi. They will also understand the basic principles of microscopy and staining procedures. They will have a basic understanding of control of microbial growth. They will learn to culture and preserve microbes. They will acquire knowledge on microbial pathogens and infections.

Course Outcome:

At the end of the course, learners will:

CO1: Gain knowledge on the history and scope of microbiology with the contributions of Scientists

CO2: Acquire knowledge about different types of microscopes and its principles with adequate information about staining

CO3: Know about prokaryotic and eukaryotic cell organization

CO4: Know about the different types of culture media and about the pure culture isolation,

preservation and maintenance

CO5: Gain knowledge on sterilization techniques and their applications

CO6: Know about the microbial pathogens - cholera, Tuberculosis, HIV Hepatitis, ringworm and candidiasis

UNIT - I

History and scope of microbiology: Contributions of eminent scientists- Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch - scope of microbiology.

UNIT - II

Microscopy and staining: Principles – types - light, dark field, fluorescence, phase contrast microscopy – Electron Microscopy - Staining- principle – types- simple and differential staining.

UNIT - III

Prokaryotic and eukaryotic cell organization: Prokaryotic cell- size, shape, and arrangement- bacterial cell wall components –gram positive and gram negative– cell membrane- pili – flagella- fimbriae- capsule- Eukaryotic cells –Fungal cell structure- hyphae-cell wall

UNIT – IV

Microbial cultures and preservations: Culture media – types - enrichment cultures - pure culture- isolation methods - preservation and maintenance - low temperature, deep freezing, cryopreservation.

UNIT – V

Sterilization techniques: Aseptic maintenance- physical methods – dry heat, moist heat, radiation, filtration method –sunlight drying - chemical methods and their applications – alcohols-dyes-phenols-metallic salts-gases, Antiseptics and personal hygiene

UNIT –VI

Microbial pathogens: Bacterial disease- Cholera, TB- Viral disease –HIV , hepatitis – Fungal disease- Ringworm, Candidiasis

TEXT BOOK:

Prescott L.M, Harley J. P and Klein D.A, (2006) Microbiology, 8th edn. McGraw Hill Book Co, New Delhi.

REFERENCES:

1. Pelczar MJ, Chan E. C. S, Kreig NR (1986) Microbiology, 5th edn, McGraw Hill, New Delhi.
2. Dubey, R.C. and Maheswari, D.K. (2005) A Text book of Microbiology. S. Chand & Company Ltd. New Delhi.
3. Jacquelyn G. Black (2013), Microbiology, 8th edn, John Wiley & Sons International Publication.