

R. Krishna Veni,

Asst. Professor in Microbiology,

Notes of Lesson (Even Semester 2021-2022)

1. I UG (Microbiology)

Microbial Physiology (UQRIMBCC3)

2. I PG (Microbiology)

Microbial Nanotechnology (PQRIMBFC2)

D/H	1	2	3	4	5
I D	IPM		IUM		IUM
II D		IPM		IPM	
III D	← M-LAB →				
IV D	IUM		IPM		IUM
V D	IUM				IUM
VI D				IUM	

Subject: Microbial physiology.

class: I UG (Microbiology)

Sem: II

Sub. code: UQRIMBCC3.

Unit: I - Nutrition and growth of microorganisms!

Nutrition and growth of microorganisms:
nutritional types of microorganisms, nutritional requirements. Factors influencing the growth of microorganisms - temperature, pH, osmotic pressure, moisture, radiation and chemicals, physiology of growth - significance of various phases of growth. Growth measurements - batch, continuous and synchronous.

Unit: II - Enzymes!

Bacterial enzymes - classification - oxidoreductase, transferase, hydrolase, lyase, isomerase and ligase, properties, coenzymes and cofactors, isozymes. Mechanism of enzyme action, conditions affecting enzyme activity.

Unit: III - Energy production

Metabolism of carbohydrates: Anabolism - Photosynthesis: Oxygenic and anoxygenic, Synthesis of carbohydrate, Catabolism of glucose - Embden Meyer Hoff - Patnas pathway, Pentose pathway, Kreb's

electron transport system

1. Lactic acid fermentation
2. Alcohol fermentation.
3. Acetic acid fermentation
4. Butyric acid fermentation

Advantages of fermentation
Wine, Beer, Biofuels, Yoghurt, Pickles
Bread, some foods contain
Antibiotic and Vitamins.


Dr. P. JEEVAN, M.Sc., M.Phil., Ph.D.
Head, Department of Microbiology,
J.J. College of Arts & Science (Autonomous),
J.J. Nagar, Sivapuram (Post),
Pudukkottai - 622 422.




Dr. J. PARASURAMAN, M.A., M.B.A., M.C.A.
M.Phil., B.Ed., Ph.D.

PRINCIPAL
J.J. College of Arts and
(Autonomous)
J.J. Nagar, Sivapura
PUDUKKOTTAI - 6

Dr. M. Poojamma
Assistant Professor
Dept. of Microbiology

Notes of Lesson

Even semester (2021 - 2022)

III UG - Genetic Engineering

I PG - Microbial Genetics

B/H	1	2	3	4	5
1		<u>I</u> PG		<u>III</u> UG	
2	<u>III</u> UG		<u>I</u> PG		
3			<u>III</u> UG		<u>I</u> PG
4	<u>I</u> PG				<u>III</u> UG
5				<u>I</u> PG	
6		<u>III</u> UG			
	← <u>I</u> PG LAB →				

MBE II - GENETIC ENGINEERING

Paper Code: U6R1MBMBE2

No. of Credits: 4

Max marks: 25+75=100

Semester: VI

No. of hours per week: 5

Total Inst. Hrs: 60

Objectives

- To be aware of the basics about nucleic acid
- To understand the different vectors
- To know the enzymes used in molecular biology
- To familiarize with the gene manipulation
- To understand how these tools are used in research and industries

Unit I: Nucleic acids

12 hrs
Definition and Functions. Difference between DNA and RNA. Properties of DNA - denaturation renaturation, melting curve, hyperchromicity.

Unit II: Vectors

12 hrs
Cloning vectors - plasmids, phage vector, phagemids and cosmids, Ti-plasmid, pBR322, pSC101, pUC Shuttle vectors and expression vectors - Yeast Artificial Chromosome (YAC), Bacterial Artificial Chromosome (BAC).

Unit III: Enzymes

12 hrs
Enzymes - Nucleases - Exonucleases and Endonucleases, Concept of restriction and modification - Restriction endonucleases, Ligases, Polymerases, DNA modifying enzymes, Topoisomerases, Methylases - their uses and applications.

Unit IV: Gene manipulation

12 hrs
Gene and its manipulation techniques; Definition of a gene, structure, cloning techniques, methods of Gene transfer, construction of genomic libraries and c-DNA Libraries. RNA splicing, brief account of DNA sequencing. Site directed mutagenesis.

Unit V: Hybridization techniques

12 hrs
Nucleic acid and protein hybridization technique - Southern, Northern and Western blotting techniques. DNA amplification using polymerase chain reaction (PCR): types and applications of PCR, DNA fingerprinting and its applications.

Unit VI: Unit VI: Latest Learning (for Continuous Internal Assessment only) Latest developments related to the course during the Semester)

Date: 11.05.22

Day order: 2nd

Hour: 3rd

Melting curve

→ Melting curve analysis is an assessment of the dissociation characteristics of double-stranded DNA during heating.

→ As the temperature is raised, the double strand begins to dissociate leading to a rise in the absorbance intensity, hyperchromicity.

Date: 12.05.22 Day order: 3rd

Hour: 5th

Hyperchromicity

→ Hyperchromicity is the increase of absorbance (optical density) of a material.

→ The most famous example is the hyperchromicity of DNA that occurs when a DNA duplex is denatured.

→ The UV absorption is increased when two single DNA strands are being separated.

P. Jeevan
Dr. P. JEEVAN, M.Sc., M.Fnh., Ph.D.
Head, Department of Microbiology,
J.J. College of Arts & Science (Autonomous),
J.J. Nagar, Sivapuram (Post),
Pudukkottai - 622 422.



C. Par
Dr. J. PARASURAMAN, M.A., M.B.A.,
M.Phil., B.Ed.
PRINCIPAL,
J.J. College of Arts and Science
(Autonomous)
J.J. Nagar, Sivapuram (Post),
PUDUKKOTTAI - 622 422

Notes of Lesson

Dr. M. Anjugam,

Assistant professor,

Department of microbiology

J.J. College of Arts and Science (Autonomous)
Pudukkottai

2021 - 2022 - Even Semester

Papers Handling

II - UG - Environment and Agricultural microbiology

III - UG - Medical Lab Technology

I - PG - Medical Microbiology.

11 - 001

**CC-VII ENVIRONMENT and AGRICULTURAL
MICROBIOLOGY**

Paper Code: U4R1MBCC7
No. of Credits: 5
Max marks: 25+75=100

Semester: V
No. of hours per week: 5
Total Inst. Hrs: 72

Objectives

- ◆ To know the physico chemical characteristics of soil and role of microbes in improving soil fertility.
- ◆ To become familiar with some important Indian crop diseases
- ◆ To inculcate the spread of air born and water borne diseases
- ◆ To Acquire the knowledge of Aquatic ecosystem
- ◆ To know the solid and liquid waste management

Unit I: Introduction to soil microbiology

16 hrs

Soil microbiology - Introduction – Soil as an environment for microorganisms. Classification of soil physical and chemical properties of soil, soil stratifications – soil microorganisms – biogeochemical cycles – C, N and P.

Unit II: Microbial interactions

14 hrs

Microbial interactions definition and types - mutualism, commensalism, amensalism – synergism parasitism – predation - competition. Brief account of diseases – bacterial (blight of paddy, citrus canker), fungal (late blight of potato, stem rust of wheat), viral (tobacco mosaic virus, cucumber mosaic virus).

Unit III: Aeromicrobiology

14 hrs

Composition of air, kinds of organisms in air, distribution and sources. Droplets nuclei, aerosol and infectious dust, assessment of air quality. Brief account of air – borne diseases.

Unit IV: Aquatic ecosystems

14 hrs

Types of aquatic ecosystems: fresh water – ponds, lakes, streams. Marine habitats –estuaries, mangroves, deep sea, saltpan, coral reefs. Zonation – upwelling – eutrophication. Portability of water - microbiological assessment of water quality – water purification. Brief account of water borne diseases.

Unit V: Waste management

14 hrs

Types of wastes – solid and liquid waste treatment. Solid waste treatment – saccharification – gasification – composting. Liquid waste treatment – primary –secondary – tertiary treatment. Utilization of liquid and solid wastes – food (SCP) –fuel (methane).

Unit VI: Latest Learning (for Continuous Internal Assessment only) Latest developments related to the course during the Semester

References:

1. Atlas Ronald, M., Bartha, and Richard (2009). Microbial Ecology (4th Edition) Benjamin/Cummings Publishing Company, California (Unit III and IV covered).

Date: 30-3-2022 Day order: V

Hour: 2nd & 5th

Topic: Interactions among soil microorganisms:

- (i) Beneficial: Mutualism, Commensalism, proto-cooperation
- (ii) Harmful: Amensalism, Antagonism, Competition, parasitism, predation.
- (iii) Mutualism - positive relationship between two partners i.e. Both partners getting benefited,
- Exchange of nutrition - Symbiosis
- Lichen, Rhizobium, mycorrhiza etc.
- (iv) Commensalism - One organism getting benefit and other not getting affected.
- (v) Antagonism - one species inhibit another species
- Amensalism - one partner suppress the growth of other by providing toxic substance
- parasitism - One organism lives on the body of another organisms
- Bacteriophage
- predation - Predator organisms directly feed and kills the prey organisms
- Nematophages fungi

S. VIJAYASAMOONDESKARI,

ASST. PROF.

DEPT. OF MICROBIOLOGY.

LESSON PLAN.

EVEN SEMESTER [2021-2022]

SBE I - VERMITECHNOLOGY

Course Code: U4R1MBSBE1

Semester: IV

No. of Credits: 4

No. of hours per week: 2

Max marks: 25+75=100

Total Inst. Hrs: 48

Objectives

- ◆ To learn the basic principles of biological, chemical and environmental concepts of pertaining to vermitechhnology.
- ◆ To create knowledge on Environmental degradation.
- ◆ To get the theoretical knowledge on vermicompost bed preparation.
- ◆ To create knowledge on Self- EmploymentOppurtunity.

Unit-I

12 hrs

Definition, Scope and importance – common species for culture – Environmental requirements – culture methods – Benefits and constraints of vermicomposting.

Unit-II

9 hrs

Taxonomic position and diversity - Types – morphology and physiology of earthworm – Ecological role and needs for earthworm culture/wormery breeding techniques – indoor and outdoor cultures – monoculture and polyculture – relative merits and demerits.

Unit-III

9 hrs

Applications of vermiculture – vermin – composting, use of vermicastings in organic farming, horticulture – earthworms for management of biomedical solid waste – feed/bait for capture /culture fisheries – forest regeneration.

Unit-IV

9 hrs

Marketing the products of vermiculture - quality control, market research, marketing techniques – creating the demand by awareness, demonstration and advertisement – packing and transport – direct marketing.

Unit- V

9 hrs

Future perspectives – Predators/ athogen control in wormeries – Cost – benefit analysis of vermin-composting – potential and constraints for vermiculture in India.

Unit VI: Unit VI: Latest Learning (for Continuous Internal Assessment only) Latest developments related to the course during the Semester)

15.8.22 + Day order: IV

Hours: 3rd

Topic: Secondary Screening methods.

* Secondary Screening means conducting any assay, screen or other test using intracellular receptors on a Collaboration Compound for the purpose of confirming the results of the Primary Screening or to test such Collaboration Compound for cross-reactivity with other than the Targets.

16.3.22. Day order: V

Hours: Lab 1 to 5

Topic: Lab - Isolation of Bacteria from Food Sample

17.3.22 Day order: VI

Hours: I & II

Topic: Strain Improvement methods. - PPT

I - hours: Special Lecture Programme

PPT 14/3/22
Dr. P. JEEVAN, M.Sc., M.Phil., Ph.D.
Head, Department of Microbiology,
J.J. College of Arts & Science (Autonomous),
J.J. Nagar, Sivapuram (Posi),
Pudukkottai - 622 422.



G.P.
Dr. J. PARASURAMAN, M.A., M.B.A., M.C.A.
M.Phil., B.Ed., Ph.D.

PRINCIPAL
J.J. College of Arts and Science
(Autonomous)
J.J. Nagar, Sivapuram Posi,
PUDUKKOTTAI - 622 422

R. Krishnaveni

Asst. Professor in Microbiology

Notes of lesson (odd - 2021 - 2022)

S.No	class	code	Title of the Paper
1.	III UG	U5RIMBMBE1	Microbial Biotechnology
2.	II PG	P5RIMBCC12	Microbial Biotechnology
3.	I PG	P4RIMBCC3	Microbial Physiology

01/07/21

Day order : I

Hour : I

⇒ Syllabus discussion .

(Unit 1, 2, 3, 4, 5)

⇒ Biotechnology - Introduction .

- Fusion or an alliance between biology and technology .

- The term biotechnology was introduced in 1917 by a Hungarian engineer Karl Ereky

- Biotechnology - Definition

BT is technology based on biology, especially when used in agriculture, food science and medicine . United Nations Convention on Biological Diversity defines - any technological application that uses biological systems, living organisms or derivatives thereof, to make or modify Products or Processes for specific use.

2/07/21 Day order : II

Hour : V

Concept of Biotechnology !

⇒ The application of technology to improve a biological organism by adding genes from another organism .

- Fermentation is the oldest biotechnological process discovered by the people by prolonged of grains .

- Early processes practiced by man included leavening of bread, production of alcoholic beverages, production of vinegar, production

30.09.21

Day order: I

How: I

Latest learning. (New paper collection)

01.10.21

Day order: I

How: I

Question Bank: 2 marks all units
discussion.

07/10/21

Day order: III

How: IV

Question Bank: 5 marks all units
discussion.

09/10/21

Day order: IV

How: IV

Question Bank: 10 marks all units
discussion.

12/10/21

Day order: V

How: II, III

Latest Learning.

21/10/21

Day order: I

How: I

Question paper discussion

23/10/21

Day order: II

How: V

Latest learning.

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Dr. M. Poornima

Assistant professor

Department of Microbiology

Notes of Lesson

Odd Semester (2021-2022)

CC-IX IMMUNOLOGY

Paper Code: U5R1MBCC9

Semester: V

No. of Credits: 5

No. of hours per week: 5

Max marks: 25+75=100

Total Inst. Hrs: 72

Objectives

- ◆ To acquire with basic knowledge in immunology
- ◆ To familiarize with the immunity and immune system
- ◆ To understand the antigen antibody reactions
- ◆ To study the various allergic reactions

Unit – I

16 hrs

Introduction: – History of Immunology – Immunoematology, Blood groups – ABO and Rh typing, Blood transfusion – Rh – incompatibilities – immunity – types of immunity – Innate – Anatomical, physiological, phagocytic and inflammatory barriers, Acquired – cell mediated and humoral immunity. Hematopoiesis.

Unit – II

14 hrs

Immune systems: Anatomy of lympho- reticular system – Primary lymphoid organs- bone marrow and thymus; Secondary lymphoid tissue – spleen, lymphnodes, MALT and GALT; cells of the immune system – detailed aspects of T and B lymphocytes – receptors – activation and function.

Unit – III

14 hrs

Antigens: Types, properties, immunogen, epitope, paratope, haptens – adjuvants – vaccines – types whole organisms vaccine, purified macromolecule vaccine, recombinant vaccine, anti-idiotypic vaccine and DNA vaccine. – toxoids, antitoxins. Antibody – structure, types and properties. Theories of antibody production. Complement pathway- classical and alternate.

Unit – IV

14 hrs

Antigen – antibody reactions – in vitro methods; Agglutination – Widal test, Haemagglutination, HAI, and Precipitation – Immunodiffusion and Immunoelectrophoresis, Complement fixation, Immunofluorescence, Enzyme linked immunosorbent assay (ELISA), Radioimmuno assay (RIA) and Fluorescent insitu hybridization (FISH).

Unit – V

14 hrs

Hypersensitivity reactions – antibody (IgE) mediated - Type I anaphylaxis, Type II – Antibody dependent cell mediated cytotoxicity, Type III – immune complex reactions – respective diseases and immunologic methods of diagnosis – cell mediated immune responses – Lymphokines, Cytokines. Type IV – Hypersensitivity reactions, in vivo methods; Skin tests – immune complex tissue demonstrations, MHC and transplantation.

Unit VI: Latest Learning (for Continuous Internal Assessment only) Latest developments related to the course during the Semester

Date: 01.11.21

Day order: 6th

Hour: 2nd

Properties of Antibody

→ Immunoglobulins are heterodimeric proteins composed of two heavy (H) and two light (L) chains.

→ They can be separated functionally into variable (V) domains that binds antigens and constant (C) domains that specify effector functions.

Date: 02.11.21

Day order: 6th

Hour: 2nd

Types of antibodies

→ There are 5 types of heavy chain constant regions in antibodies.

→ The 5 types - IgG, IgM, IgA, IgD and IgE.

→ They are classified according to the type of heavy chain constant region, and are distributed and function differently in the body.

P.J. 2/11/21
Dr. P. JEEVAN, M.Sc., M.Phil., P.D.
Head, Department of Microbiology,
J.J. College of Arts & Science (Autonomous),
J.J. Nagar, Sivapuram (Post),
Pudukkottai - 622 422.



Dr. J. Parasuraman
Dr. J. PARASURAMAN, M.A., M.B.A., M.E.,
M.Phil., B.Ed.,
J.J. College of Arts & Science (Autonomous),
J.J. Nagar, Pudukkottai - 622 422.
Post 22

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NOTES OF LESSON

Dr. M. Anjugam,
Assistant Professor,
Department of Microbiology,
J.J. College of Arts & Science,
Pudukkottai.

[2021-2022 - odd - Semester]

PAPERS HANDLING

S.No	Sub. code	Subject	class	SEM
1	UBRIMBSBE3	Mushroom Technology	<u>III</u> UG	<u>V</u>
2	PIRIMBCC1	Advanced Microbiology	<u>I</u> PG	<u>I</u>
3	P3RIMBCCII	Environment and Agricultural microbiology	<u>II</u> PG	<u>III</u>

SBE III - MUSHROOM TECHNOLOGY

Paper Code: U6R1MBSBE3

No. of Credits: 2

Max marks: 25+75=100

Semester: VI

No. of hours per week: 4

Total Inst. Hrs: 24

Objectives

- ◆ To give the basics of mushrooms in human food
- ◆ To know mushroom propagation for food industries
- ◆ To give an opportunity for future entrepreneurship
- ◆ To get knowledge on mushroom cultivation
- ◆ To get idea on nutrition availability in mushroom

Unit I: Introduction

Introduction – History – scope of edible mushroom cultivation – Types of edible mushroom available in India – *Calocybe indica*, *Volvariella volvacea*, *Pleurotussajor-caju*, *Agaricus bisporus*.

Unit II: Pure culture

Pure culture – preparation of media (PDA and Oatmeal agar media) sterilization – Preparation of test tube slants to store mother culture – culturing of *Pleurotus* mycelium on petriplates – Preparation of mother spawn in saline bottle and polypropylene bags and their multiplication.

Unit III: Cultivation Technology

Cultivation Technology: Infra structure, locally available substrates, polythene bags, vessels, inoculation hood, inoculation loop, low cost stove, sieves, Culture rack, Mushroom unit (Thatched house) – Mushroom bed preparation – Paddy straw, sugarcane trash, maize straw, banana leaves.

Unit IV: Storage and nutrition

Storage and nutrition: Short term storage – long term storage (scanning, pickles, papads, drying, and storage in salt solutions) – Nutrition: Proteins, amino acids, mineral elements. Nutrition: Carbohydrates – Crude fiber content, vitamins.

Unit V: Food preparation

Food preparation: Types of foods prepared from mushroom – soup, cutlet, omlette, samosa, pickles, curry. Research centers – National level and Regional level. Cost benefit ratio – Marketing in India and abroad – Export value.

Unit VI: Unit VI: Latest Learning (for Continuous Internal Assessment only) Latest developments related to the course during the Semester)

Date: 18.8.21

Day order: V

Hour: 4th

Principles of preservation

- * 1. Removal of water
- * 2. Heat Sterilization
- * 3. Lowering of Temperature.
- * 4. providing chemical Environment
- * 5. Sterilization with ionizing radiation.
- * Different methods of preservation by chemicals; canning, Drying (or) dehydration, Freezing, freeze Drying, Freezing, Irradiation, preservation by sugar, salt, oil, spices.

Date: 19.8.21

Day order: VI

Hour: 4th

Mushroom processing technology :-

- * Canning \Rightarrow High temperature processing
- * Drying \Rightarrow Preservation by reducing the moisture content.
- * Freezing \Rightarrow Subjecting to low temp (-60°C)
- * Freeze-Drying \Rightarrow Drying through sublimation.
- * Chemical preservation: such as SO_2 , Sorbic acid, sodium benzoate, Benzoic acid, ascorbic acid, acetic acid, Citric acid.
- * pickling \Rightarrow with salt, oil, spices and vinegar

S. Vijaya Sampoornaswari

Asst. Prof.

Dept. of Microbiology

Papers Handling

1. Value Education - II UG
2. Virology and Medical Microbiology - IV UG
3. Fermentation Technology - II PG
4. Bioinformatics - II PG

Virology and Medical Microbiology

(III - VA) [USRIMBCC10]

Unit - I [Introduction to Virology]

History of Virology, General Properties of Viruses, Ultra structure of viruses. Cultivation of viruses. Purification & characterization of viruses and enumeration of viruses.

Unit - II Viruses of plant, Animal and Bacteriophage.

Plant: Tobacco Mosaic viruses, Cauliflower Mosaic viruses, Bunchy Top of Banana, Satellite viruses, Virioids, Animal: Prions, Rinder Pest, Ranikhet, Dion, foot and mouth disease. Bacteriophage: T₄ Bacteriophage and Lambda Phage.

Unit - III Introduction of Medical Microbiology.

Normal microbial flora of human body.

Host microbe interaction. Infections - source, types and transmission. Collection and transport of specimen for microbiological examination - pus, sputum, Urine, faeces, CSF and Throat Swab.

Unit - IV Bacterial diseases.

Classification, morphology, cultural characteristics, Pathogenicity, epidemiology, Laboratory diagnosis, treatment, prevention and control of diseases caused by: Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,

19.8.21

Day Order: VI

Hour: 3

Topic: FASTA

* The FASTA format is a text based format for representing either nucleotide sequence or amino acid (protein) sequences, in which nucleotides or amino acids are represented using single-letter codes.

* The format also allows for sequence names and comments to precede the sequence.

Day Order: VI

Hour: 4

Topic: Pairwise Sequence

* Pairwise sequence alignment is used to identify regions of similarity that may indicate functional, structural and/or evolutionary relationships between two biological sequences.


Dr. P. JEEVAN, M.Sc., M.Fmr., Ph.D.
Head, Department of Microbiology,
J.J. College of Arts & Science (Autonomous),
J.J. Nagar, Sivapuram (Post),
Pudukkottai - 622 422.



Dr. J. PARASURAMAN, M.A., M.B.A., M.C.A.,
M.Phil., B.Ed., Ph.D.
PRINCIPAL
J.J. College of Arts and Science
(Autonomous)
J.J. Nagar, Sivapuram Post,
PUDUKKOTTAI - 622 422