PG MICROBIOLOGY

PCMBG20: MAIN PRACTICAL –I: APPLIED MICROBIOLOGY AND IMMUNOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: II	PCMBG20	Main Practical I: Applied Microbiology and Immunology	Practical	Core	5	5	100

Course Objective: To enable the students to get hands-on training on various aspects of general, food, agricultural, environmental microbiology and immunotechnology.

Course Outcomes (CO):

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

CO1: Identify morphology of bacteria using different staining procedure and isolating them by pure culture techniques.

CO2: Assess the quality of air, water, food and soil samples.

CO3: Examine the activity of extracellular enzymes.

CO4: Apply agglutination and precipitation methods to detect antigen and antibody.

CO5: Select appropriate chromatographic methods to separate aminoacids, pigments and from crude extracts.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	H
CO2	H	H	H	L	M	H
CO3	H	H	M	M	L	H
CO4	L	H	H	H	L	H
CO5	L	H	M	L	M	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	L	H
CO2	H	H	H	L	L	H
CO3	H	M	M	M	L	H
CO4	H	M	H	H	L	H
CO5	H	M	M	L	L	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

1. Cleaning of glassware and sterilization.
2. Preparation and use of glassware cleaning solutions, sterilization.
3. Micrometry - counting and measurements.
4. Pure and axenic culture techniques - serial dilution - pour plate, spread plate, streak plate methods and stab culture techniques.
5. Bacterial Staining methods - simple, Gram's, acid fast, flagella, capsule and spore.
6. Fungal staining method – Lacto phenol cotton blue.
7. Motility of bacteria – Hanging drop technique.
8. Determination of growth - growth curve - generation time and a synchronous growth.
9. Microbial analysis of food products - bacterial and fungal.
10. Extracellular enzyme activities - cellulase, protease, lipase and phosphatase.
11. Dairy microbiology - Direct microscopic count - Standard plate count - reductase test (resazurin/methylene blue) - isolation of microbes from yoghurt, curd.
12. Quantification of microorganisms in air - solid and liquid impingement techniques.
13. Analysis of water – Most probable number test and membrane filter technique.
14. Microbial flora from different soil types and habitats - isolation of nitrogen fixing bacteria, phosphate solubilizing organisms- development of Winogradsky Column
15. Precipitation techniques: Agar gel diffusion - Ouchterlony's method, Single radial immunodiffusion, Counter immuno electrophoresis & Rocket Immuno Electrophoresis.
16. Agglutination techniques: Blood grouping and Rh factor - Latex agglutination - RF & ASO. Haemagglutination RPHA / IHA.
17. Labelled Assays: Demo: Enzyme Linked Immunosorbent Assay (ELISA).
18. Separation of pigments using paper chromatography.
19. Separation of compounds from crude extracts using TLC.

REFERENCE BOOKS

1. Dubey, R.C. and Maheshwari, D.K. (2002) Practical Microbiology, 1st Edn. S. Chand & Co. Ltd., New Delhi.
2. Cappuccino, J. and Sherman, N. (2002) Microbiology: A Laboratory Manual, 6th Edn. Pearson Education Publication, New Delhi.

3. Collee, J.C., Duguid, J.P., Fraser, A.C. and Marimon, B.P. (1996) Mackie and McCartney Practical Medical Microbiology, 14th Edn. Churchill Livingstone, London.
1. Holt, J.S., Krieg, N.R., Sneath, P.H.A. and Williams, S.S.T. (1994) Bergey's Manual of Determinative Bacteriology, 9th Edn. Williams & Wilkins, Baltimore.
1. Gerhardt, P., Murray, R.G., Wood, W.A. and Kreig, N.R. (Eds) (1994) Methods for General and Molecular Bacteriology. ASM Press, Washington, DC.
2. Finegold, S.M. (2000) Diagnostic Microbiology, 10th Edn. C.V. Mosby Company, St. Louis.

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VIRTUAL LABS/ INTERACTIVE SIMULATIONS:

1. www.vlab.co.in
2. www.aview.in/aview
    1. www.pbs.org
2. www.micro.magnet.fsu.edu/primer/java/scienceopticsu

VIDEO LESSONS:

1. www.learnerstv.com
2. www.webcast.berkeley.edu
3. www.cosmolearning.org

PCMBO20: MAIN PRACTICAL – IV: TEXTILE AND COSMETIC MICROBIOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: IV	PCMBO20	Main Practical IV: Textile and cosmetic Microbiology	Practical	Core	5	5	100

Course Objective: To provide hands-on training and acquire adequate skill required for testing the quality of cosmetics and textile materials.

Course Outcomes (CO):

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

CO1: Utilize the techniques for decolourization of textile industrial waste.

CO2: Estimate of BOD, COD and total solids in effluent sample.

CO3: Demonstrate the antimicrobial activity of textile materials.

CO4: Evaluate the antifungal property of treated textile materials.

CO5: Enumerate microorganisms in cosmetics, perfumes and essential oils.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	M	H	L	H
CO2	H	H	H	L	M	H
CO3	H	H	M	M	L	H
CO4	L	H	H	H	L	H
CO5	L	H	M	L	M	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	L	H
CO2	H	H	H	L	L	H
CO3	H	M	M	M	L	H
CO4	H	M	H	H	L	H
CO5	H	M	M	L	L	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS

1. Determination of biological oxygen demand (BOD) of water.
2. Determination of chemical oxygen demand (COD) of water.
3. Estimation of total solids in effluent sample.
4. Analysis of TDS of effluent content.
5. Estimation of total suspended solids of effluent.
6. Decolorization of distillery or textile industrial waste.
7. Antibacterial activity assessment of textile materials.
8. Evaluation of antifungal property of treated textile materials.
9. Testing for antibacterial activity and efficacy on textile products, Qualitative and quantitative.
10. Determination of antibacterial activity of Textile fabrics by Agar diffusion plate test.
11. Microbiological Enumeration Tests of Cosmetics, Perfumes and Essential Oils.

REFERENCES:

1. R.C. Dubey and D.K.Maheswari. (2005) Practical Microbiology. S.Chand & Company.
2. S.Rajan and R.Selvi Christy. (2007) Experimental Procedures in Life Sciences. Anjana Book House Publishers & Distributors.
3. Philip A. Geis. (2006). Cosmetic Microbiology. A Practical Approach. 2nd edition. Taylor and Francis Group.

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VIDEOS/VIDEO LESSONS / E-CONTENT FOR LEARNING:

1. http://www.learnerstv.com/
2. http://webcast.berkeley.edu/
3. http://cosmolearning.org/
4. http://www.world-lecture-project.org/
5. http://cec.nic.in/
6. http://epgp.inflibnet.ac.in/
7. http://www.co-learn.in/

PEMBE20: ELECTIVE-IIIA: BIOINOCULANTS TECHNOLOGY

Year 2020	Course Code	Title Of The Course	Course Type	Course Category	H/W	Credits	Marks
SEM: III	PEMBE20	Bioinoculants Technology	Theory	Core Elective	3	3	100

Course Objective: To provide the learners an overview on the potentials of microbes as fertilizers and their beneficial impacts in soil and agriculture.

Course Outcomes (CO):

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

CO1: Outline the importance of bioinoculant technology and discuss on the significance of biofertilizers.

CO2: Demonstrate the mass production and applications of bio fertilizer and their impact on plant growth.

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

CO4: Explain the types of mycorrhizal associations and quantification.

CO5: Formulate the growth of phosphate solubilizing microbes.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	M	L	H
CO2	H	H	H	L	L	H
CO3	H	M	M	H	M	H
CO4	H	M	H	H	M	H
CO5	H	M	H	M	M	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	H	L	H
CO2	H	L	H	M	L	H
CO3	H	M	H	L	L	H
CO4	H	H	H	M	L	H
CO5	H	L	H	L	L	H

H – HIGH (3)
M – MODERATE (2)
L – LOW (1)

COURSE SYLLABUS:

UNIT– I: Symbiotic Bacterial N_2 fixers. (9 hours)

1.1 General account of the microbes used as biofertilizers for crop plants. (K1,K2)

1.2 Advantages of Biofertilizers over chemical fertilizers. (K1,K2)

1.3 Symbiotic N2 fixers: Rhizobium - Isolation, characterization, identification, classification. (K1,K2, K3,K4)

1.4 Inoculum production and field application. (K1,K2,K3,K4,K6)

1.5 Frankia - Isolation, characterization. (K1,K2,K3,K4)

1.6 Actinorrhizal nodules – non-leguminous crop symbiosis. (K1,K2)

UNIT – II: Non Symbiotic N_2 fixers. (9 hours)

2.1 Introduction to non-symbiotic N_2 fixation. (K1,K2)

2.2 Non - Symbiotic N2 fixers – Azospirillum. (K1,K2)

2.3 Free living - Azotobacter . (K1,K2)

2.4 Isolation of free living nitrogen fixers from soil. (K1,K2,K3)

2.5 Characterization of non-symbiotic N_2 fixers. (K1,K2,K3)

2.6 Mass inoculum production and field application. (K1,K2, K3, K4,K6)

UNIT – III: **Algal Biofertilizers. (9 hours)**

3.1 Symbiotic N2 fixers – Cyanobacteria. (K1,K2)

3.2 Azolla – Isolation and characterization. (K1,K2,K3)

3.3 Mass multiplication- production. (K1,K2,K3,K4)

3.4 Role of Azolla in rice cultivation .(K1,K2)

3.5 Crop response to algal biofertilizers. (K1,K2)

3.6 Field application - immobilization. (K1,K2,K3)

UNIT – IV: Phosphate Solubilizers. (9 hours)

1.1 Phosphate solubilizers - Phosphate solubilizing microbes. (K1,K2)

1.2 Isolation of phosphate solubilizers from soil. (K1,K2,K3,K4)

1.3 Characterization of phosphate solubilizers, (K1,K2, K3,K4)

1.4 Mass inoculum production. (K1,K2, K3,K4)

1.5 Field application and crop response. (K1,K2,K3)

1.6 Mechanism of Phosphate solubilization. (K1,K2)

UNIT – V: Mycorrhizal Biofertilizers. (9 hours)

5.1 Mycorrhizal bioinoculants – classification. (K1,K2)

5.2 Importance of mycorrizal Ectomycorzhizae - Endomycorrhizae - Ectendo mycorrhizae - Taxonomy of mycorrhizae. (K1,K2)

5.3 Isolation of VA mycorrhizae. (K1,K2, K3,K4)

5.4 Quantification and assessment of VAM in roots . (K1,K2,K3,K4)

5.5 Mass inoculum production of VAM . (K1,K2,K3,K4,K6)

5.6 Field applications and advantages of Ectomycorrhizae and VAM. (K1,K2,K3)

TEXT BOOKS

1. Kannaiyan, S. (2003). Bioetchnology of Biofertilizers, CHIPS, Texas.
2. Dubey R.C (2005). A Text of Biotechnology. Multicolour Illustrative edition, S.Chand and Company Ltd., New Delhi.
3. Subba Rao NS (2004). Soil Microbiology. 4th edition, Oxford and BH Publishing Co.Pvt. Ltd., New Delhi.

REFERENCES:

1. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
2. Reddy, S.M. et. al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
3. Subba Rao N.S (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.
4. Subba Rao N.S. (1988) Biofertilizers in Agriculture and forestry Oxford and IBH Publishing Co., Ltd., New Delhi.

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DIGITAL LIBRARIES:

1. http://www.loc.gov/
2. http://library.clark.edu/
3. http://www.dli.ernet.in/
4. http://www.loc.gov/education/