

c. Research Paper Presentation

10 marks

The student shall select a research paper previously published in a scientific journal (or he/she may use own data) and present the same as an oral papers before an audience comprising the postgraduate students and faculty of the department as done in conferences/symposia. The presentation shall be for a total of TEN minutes, consisting of precisely SEVEN minutes presentation followed by a discussion for THREE minutes.

Component Total Marks

50 marks

3. Component – III: Dissertation

This is the core component of the course and includes the actual research component and shall be considered to constitute a part fulfillment of the course requirements. The student shall select a topic in consultation with his/her supervisor and carry out research work on it over a span of one calendar year from the time of joining the course. This research work shall then be submitted as a dissertation prepared in the IMRAD system, in a bound form as per norms specified by the University. The assessment of this dissertation shall be done partly by the internal supervisor/guide and partly by an external referee appointed by the University. After the report of the external referee is obtained, on a mutually convenient date, the student will present his/her work in open defence organized in the Department before an invited audience. The scheme of evaluation is as under:

- | | |
|-------------------------------------|-----------|
| a. by the internal supervisor/guide | 100 marks |
| b. By the external referee | 100 marks |
| c. Open defence | 50 marks |

Component Total marks

250 marks

Grand Total Marks

Component – I	300 marks
Component – II	50 marks
Component – III	250 marks
Grand Total for the course	600 marks

B. SYLLABUS OF THEORY PAPERS

PAPER – I: Research Methodology (compulsory)

A. An Insight into Research:

Definition and basic concepts, objectives, significance and techniques of research, finding research materials – literature survey, compiling records.

B. Scientific Writing:

a) Definition and kinds of scientific documents – research paper, review paper, book reviews, theses, conference and project reports (for the scientific community and for funding agencies).

b) Components of a research paper – the IMRAD system, title, authors and addresses, abstract, acknowledgements, references, tables and illustrations.

c) Dealing with publishers – submission of manuscript, ordering reprints.

d) Oral and poster presentation of research papers in conferences/symposia.

e) Preparation and submission of research project proposals to funding agencies.

C. Biostatistics:

a) Definition, population and sample, sampling techniques and types of samples, statistics and parameters.

b) Summarisation of data and estimation

i) Measures of Central tendency – Mean, Median, Mode

ii) Measures of Dispersion – Variance and Standard Deviation

iii) Estimation – Confidence Interval

c) Hypothesis testing – significance testing, Student's 't' test, Chi square test.

d) Analysis – ANOVA, Regression and Correlation analysis.

D. Bioinformatics:

a) Basics of Internet and Bioinformatics – Telnet, FTP, e-mail, worldwide web (www), navigating the www, search engines.

b) Databases – definition, some examples of biological databases, biological database management systems

c) Use of databases

i) Sequence Alignments – concepts, methods and calculations

ii) Information retrieval from databases

iii) Phylogenetic analysis and prediction

E. Patenting and Intellectual property:

Introduction, Patent laws, composition of a patent, applying and obtaining a patent, problems encountered.

BOOKS RECOMMENDED

1. How to Write and Publish a Scientific Paper by Robert A. Day.
2. Biostatistics – A Foundation for Analysis of Health Sciences. By Wayne Daniel. John Wiley and Sons, Inc.
3. Statistics for Biologists by R. C. Campbell. Cambridge University Press
4. Elementary Bioinformatics by Imtiaz Alam Khan. Pharma Book Syndicate
5. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins by A. D. Baxevanis and B. F. F. Ouellette
6. Bergey's Manual of Systematic Bacteriology (2nd Ed.), Volume.1 Springer

PAPER – II: Recent Advances in Microbiology (compulsory)

1. Morphology, cytology and classification of Rickettsia, Chlamydia and Archaeobacteria
2. Recent advances in Bacterial Taxonomy -
 - a. Identification of Procaryotes
 - b. Polyphasic taxonomy
 - c. A phylogenetic backbone and taxonomic framework for prokaryotic systems
 - d. A road map to the use of the current Bergey's Manual
 - e. Computer taxonomy
 - f. 16s rRNA fingerprinting and lipid profile by GLC
3. Microbial sources of anti-tumour substances, enzyme inhibitors, immunomodulators, vasoactive substances.
4. Bacterial growth on inert surfaces.
5. Quorum sensing and microbial hormones – intercellular signaling.
6. Biosensors – living biosensors for the management and manipulation of microbial consortia
7. Stability and degeneration of microbial cultures upon repeated transfers.

BOOKS RECOMMENDED

1. Bergey's Manual of Systematic Bacteriology (2nd Ed.), Volumes 1 to 4 Springer
2. The Search for Bioactive Compounds from Microorganisms by S. Omura
3. Continuous Culture (Vol. 8) by A. C. R. Dean, D. C. Ellwood and C. G. T. Evans
4. Annual Reviews in Microbiology Volumes 46 & 48 by L. N. Ornston, A. Balows and E. P. Greenberg (eds). Academic Press
5. Biotechnology: Current Progress Volume 1 by P. N. Cheremisinoff and L. M. Ferrante. Technomic Publishing Co. Inc
6. Advances in Applied Microbiology volumes 6, 10, 17 by D. Perlman and Umbreit (eds). Academic Press.
7. The Physiology and Biochemistry of Procaryotes by D. White. Oxford University Press

PAPER – III (Elective – I): Agricultural Microbiology and Microbial Ecology

1. Soil Enzymes – origin and range of enzymes in soil, methods of measurement and extraction of soil enzymes, interactions between agrochemical and soil enzymes.
2. Recent advances in biological Nitrogen fixation
3. Microbial Biofertilisers.
4. Epidemiology of plant diseases
5. Biological control of soil borne plant pathogens
6. New Directions and Importance of Microbial Ecology
7. Biodiversity as a source of innovation in Biotechnology
8. Microbiology of the Extreme Environment
 - a. Hot springs, acid springs and lakes
 - b. Microbial life in hyper saline environments – ecophysiological aspects, sea and salt lakes.
 - c. Microbial life at low temperatures
 - d. Microbiology to 10,500 metres under the deep sea.
 - e. Anaerobic Microorganisms – ecophysiological aspects, principles and techniques for the isolation, enumeration and identification of Methanogens, Dissimilatory Sulphate reducing and Anoxygenic Phototrophic bacteria
9. Geomicrobiological processes – physiological and biochemical aspects, Methods in Geomicrobiology.

BOOKS RECOMMENDED

1. Soil Enzymes by R. G. Burns
2. Chemistry and Biochemistry of Biological Nitrogen Fixation by J. R. Postgate. Plenum Press
3. Biofertilizers by L. L. Somani and others. Scientific Publishers, Jodhpur
4. Plant Pathology by J. C. Walker
5. Plant Diseases by R. S. Singh
6. Microbial Ecology by J. M. Lynch
7. Bergey's Manual of Systematic Bacteriology Volume 1. Springer
8. Annual Reviews in Microbiology Volumes 46 & 49 by L. N. Ornston, A. Balows and E. P. Greenberg (eds). Academic Press
9. Microbes in Extreme Environments by D. J. Kushner
10. Anaerobes by Shapton. Academic Press
11. Microbiological Aspects of Anaerobic Digestion – A Laboratory Manual by D. R. Ranade and S. V. Gadre (eds) Agharkar Research Institute, Pune.
12. Geomicrobiology by H. L. Ehrlich

PAPER – III (Elective – II): Applied and Environmental Microbiology

1. Hydrocarbon Fermentations
2. Steroid Transformations
3. Fermentative production of Cephalosporins and Tetracyclines
4. Microbial catalysis in the generation of Flavour and fragrance chemicals
5. Biosynthesis of Insect Pheromones and Ergot alkaloids
6. Microbiology and production of Lactic Starter Culture Concentrates
7. Microbiology of Dried Milk Powders and Concentrated Milks.
8. Quality Control in the Food and Dairy Industry – HACCP system.
9. Flux Control Analysis and Metabolic Engineering in Fermentation Microbiology.
10. Recent advances in Microbiological waste treatment methods -
 - a. Activated Sludge Process
 - b. Anaerobic sludge digestion
 - c. Root zone technology
 - d. Microbial biosorption technology
 - e. Mass scale production of Effective Microorganisms (EM) for waste treatment.
 - f. Economics of waste treatment

BOOKS RECOMMENDED

1. Industrial Microbiology by L. E. Casida Jr. Wiley International Ltd.
2. Microbial Technology by H. J. Pepler. Academic Press
3. Annual Reviews in Microbiology Volume 48 by L. N. Ornston, A. Balows and E. P. Greenberg (eds). Academic Press
4. Enzyme Biotechnology by S. Sridhar
5. Food Microbiology by M. R. Adams and M. O. Moss
6. Dairy Microbiology Volumes 1 and 2 by R. K. Robinson.
7. Fermentation Microbiology and Biotechnology by E. M. T. El-Mansi and C. F. A. Bryce.
8. Microbiological Aspects of Pollution Control by Dart and Stretton. Surabhi Publishers, Jaipur
9. Treatment of Industrial Effluents by Calley, Forster and Stafford (eds). Hodder and Stoughton, London
10. Water Pollution Microbiology by R. Mitchell, Volumes 1 and 2.
11. Critical Efforts in Applied Chemistry, Vol.II – Topics in Wastewater Treatment by J. M. Sidwick (ed.). Blackwell Scientific Publishing
12. Industrial Wastewater Treatment by M. N. Rao and R. L. Datta.

PAPER – III (Elective – III): Immunology and Medical Microbiology

1. Immunoprophylaxis and Immunotherapy
2. Regulation of Immune response
3. Interleukins, Interferon and Lymphokines
4. Recent developments in Monoclonal antibody technology
5. *In vitro* synthesis of immunoglobulins, complement and other proteins
6. Rapid Detection of Food borne Pathogenic Bacteria
7. Pathophysiology of Infectious diseases – diseases of respiratory tract, digestive system, skin and soft tissues
8. Molecular basis of Mycoplasma pathogenicity, AIDS associated Mycoplasma.
9. Recent developments in aetiology, pathogenesis, diagnosis and control of AIDS.

BOOKS RECOMMENDED

1. Microbiology in the Health Sciences and Diseases by R. Fuerst
2. Immunology – A Short Course by Benjamin and others Wiley – Liss Inc.
3. Immunology by Roitt. Published by Mosby
4. Lecture notes on Epidemiology and Community Medicines by Farner and Miller
5. Annual Reviews in Microbiology Volume 48 by L. N. Ornston, A. Balows and E. P. Greenberg (eds). Academic Press
6. Handbook of Practical Immunology by D. W. Weir Volumes 2 & 3
7. Basic and Clinical Immunology by Stites and others (eds). Lange Medical Publications
8. Mechanisms of Microbial diseases by M. Schwachter, G. Medoff and D. Schlessinger. Williams and Wilkins.
9. Mycoplasmas by J. Maniloff (ed). American Society for Microbiology
10. Biotechnology: Current Progress Volume 1 by P. N. Cheremisinoff and L. M. Ferrante. Technomic Publishing Co. Inc
11. Medical Bacteriology and AIDS by N. C. Dey and T. K. Dey



SHIVAJI UNIVERSITY, KOLHAPUR

M.Phil MICROBIOLOGY COURSE

COURSE STRUCTURE

This course shall carry a total of 600 marks divided into THREE components given in the course structure below.

Component – I: THEORY	300 Marks
Component – II: SCIENTIFIC WRITING AND PRESENTATION	50 Marks
Component – III: DISSERTATION	250 Marks
GRAND TOTAL	600 Marks