

Department of Microbiology
School of Biosciences
Periyar University
Salem - 636 011, Tamil Nadu



M.Phil. Microbiology
Syllabus

**(For the students admitted
from 2018 - 2019 onwards)**

M.Phil. MICROBIOLOGY SYLLABUS
(Candidates admitted from 2018-2019 onwards)
Full Time

1. Eligibility

Candidates who have qualified for post graduate degree (any biological science) of this university or any other University recognized by the syndicate as equivalent there to shall be eligible to register for the Degree of Master of Philosophy (M. Phil) their respective subject and undergo the prescribed course of study in an approved institution or department of this University.

Candidates who have qualified their postgraduate degree on or after 1st January, 1991 shall be required to have obtained a minimum of 55% of marks in their respective postgraduate degrees to BECOME eligible to undergo the prescribed course of study in an approved Institution or department of this University.

In the case of teachers (or) others registering for part time registration, the minimum percentage of marks for registration is 50%.

For the candidates belonging to SC/ST community and those who have qualified for the Master's degree before 01.01.1991 the minimum eligibility marks shall be 50% in their Master's Degree.

2. Duration

The duration of the M. Phil course shall extend over a period of one year from the commencement of the course.

3. Course of study

Course of study for the degree shall consist of (a) Part-I comprising three written papers according to the Syllabus prescribed from time to time: and (b) Part-II Dissertation.

Part -I shall consist of Paper -I Research Methodology and Paper -II an advanced paper in the main subject. There shall be a third paper which shall be the background paper relating to the proposed Dissertation conducted internally by the College/Departments.

4. Scheme of Examinations

Part I: Written Examination (Paper I, II & III)

The examination of papers I, II and III shall be held at the end of the year. The duration for each paper shall be 3 hours carrying a maximum of 100 marks.

Paper -III examination will be conducted by the College/ Departments and the marks obtained by the candidate along with the question paper and valued answer scripts shall be sent to the University at least 15 days before the commencement of the examinations of paper I and II.

Part II: Dissertation

The exact title of the Dissertation shall be intimated with in one month after the completion of the written examination. Candidates shall submit the Dissertation to the

University through the Supervisor and Head of the Department at the end of the year from the commencement of the course which shall be valued by internal examiner (supervisor) and one external examiner appointed by the University from a panel of four names sent by the Supervisor through the Head of the Department/Principal at the time of submitting the Dissertation.

The examiners who value the Dissertation shall report on the merit of candidates as “Highly Commended” (75% and above) or “Commended” (50% and above & below 75%) or “Not Commended” (Below 50%).

If one examiner commends the Dissertation and the other examiner, does not commend, the Dissertation will be referred to the third valuation shall be final. Submission or resubmission of the Dissertation will be allowed twice a year.

The allotment of marks for (i) Theory (ii) Dissertation and Viva Voce are as follows:

(i) Theory Papers

Internal	: 25 Marks
External	: 75 Marks
Total	: 100 Marks

(ii) Project Dissertation

Dissertation	: 100 Marks
Viva Voce	: 50 Marks
Total	: 200 Marks

(iii) Internal assessment for course I, II and III

Test	: 10 Marks
Seminar	: 10 Marks
Attendance	: 05 Marks
Total	: 25 Marks

S. No	Paper	Title of Paper	Exam Hrs	Max. Mark
1	Paper I	Research Methodology and its Applications	3	100
2	Paper I	Advances in Microbiology	3	100
3	Paper I	Guide Paper	3	100
4	Part II	Dissertation	-	200
Total				500

5. Passing Minimum

A candidate shall be declared to have passed Part-I of the examination if he/she secures not less than 50% of the marks in each paper including Paper-III for which examination is conducted internally.

A candidate shall be declared to have passed Part-II of the examination if his/her dissertation is at least commended. All other candidates shall be declared to have failed in the examination.

6. Restriction in number of chances

No candidate shall be permitted to reappear for the written examination in any paper on more than two occasions or to resubmit a Dissertation more than once. Candidates shall have to qualify for the degree passing all the written papers and dissertation within a period of three years from the date of commencement of the course.

7. Conferment of Degree

No candidate shall be eligible for conferment of the M. Phil degree unless he/she is declared to have passed both the parts of the examination as per the regulations.

8. Qualifications for persons conducting the M. Phil course

No teacher shall be recognised as a Supervisor unless he possesses a Ph. D degree or two years of PG teaching experience after qualifying for M. Phil or M.Litt. Degree.

Only the post graduate departments of affiliated colleges and departments of the University will be recognized for conducting the M. Phil course provided; however, the Syndicate shall have the power to decide any other institutions of higher learning/ research within the University area for conducting the M.Phil course on merits.

PART-TIME

9. Eligibility

- (i) Teacher candidates working in the University Departments.
- (ii) Teacher candidates working in the affiliated colleges and whose qualifications are approved by the University.
- (iii) Teacher candidates working in Polytechnics approved by the Director of Technical Education or in Higher Secondary Schools and High Schools approved by State Board or Central Board of Secondary Education or Educational Institutions of IAF (within Periyar University area) who possess a Master's Degree. For the Master's Degree qualified prior to 01.01.1991, no minimum marks is prescribed; but on or after 01.01.1991, a minimum of 55% of the marks is prescribed, provided that for the candidates belonging to SC/ST community a concession of 5% of marks will be given in the minimum eligibility marks prescribed.

10. Duration

The course of study shall extend over a period of two years from the commencement of the course. The examinations for Part-I shall be taken at the end of the first year and Part-II Dissertation at the end of the second year.

11. Regulations

The Regulations governing the full-time M.Phil course with regard to the course of study, scheme of examinations passing minimum, etc and qualifications of guide conducting the M. Phil course shall apply to part-time candidates also.

12. Restriction in number of chances

No candidate shall be permitted to reappear for the written examination in any paper on more than two occasions or to resubmit a Dissertation more than once. Candidates shall have to qualify for the degree passing all the written papers and dissertation within a period of four years from the date of commencement of the course.

M.Phil. MICROBIOLOGY (Choice Based Credit System)

Course of Study

Part	Course	Course Code	Name of the course	Credits	Marks		
					IA	UE	Total
I	I	16DMPMB01	Research Methodology and its Applications	4	25	75	100
	II	16DMPMB02	Advances in Microbiology	4	25	75	100
	III	16DMPMB03	Research Background Paper	4	25	75	100
II	IV		Dissertation and Evaluation Viva-voce	8 + 4 (12)	50	100	150 50
			Total	24			500

PAPER – I: RESEARCH METHODOLOGY AND ITS APPLICATIONS

Course Objectives

The course contents are designed to gain knowledge about the research ideas, various aspects relating to research such as preparation of research paper, various citation index, use of statistics, principle and application of various instruments, and role of bioinformatics in research. The learner will get an understanding about the research related skills.

Course Outcome

At the end of the course, the learner will be able to

1. Known the basics aspects of research process, Data presentation and Research report writing.
2. Learn the principles of statistics and its tools, the basics of the various advanced instruments for analysis in research.
3. To provide an exposure to the students on the basic skills for becoming a researcher in microbiology.

UNIT - I

Research Methodology - Introduction, importance, identification of research areas, Review of Literature- Identification of knowledge gap areas and constraints - Review and synopsis presentation. Research process, Research design and experimentation - Preparation of research report. Guidelines for preparing an article - ISSN, ISBN impact factor, citation index, h-index, I-index, Google scholar, Scopus, Thomson and Reuters, Web of Science. Computers in biological research.

UNIT - II

Biostatistics - Principles and importance. Measurement and measurement scales, Sampling and data collection, Population parameters and sample estimates. Frequency distributions, Frequency polygons, Probability curve, Measures of central tendency, Variability, Z-scores, Correlation- regression, Student's t-test, Chi square test, F-test, ANOVA and Post-Hoc tests. Statistical tools - SPSS, RSM.

UNIT - III

Molecular techniques - Electrophoresis, PCR, RAPD, RFLP, field Gel Electrophoresis (PFGE), Two dimensional electrophoresis (IEF), DGCE, TGGE and TRFLP. STRR and LTRR analysis cDNA library - screening by oligonucleotide probe, nick translation, site directed mutagenesis.

UNIT - IV

Analytical Techniques - Centrifugation, Column, Microscopy - TEM, SEM, AFM, Confocal microscope, HPLC, HPTLC, GC-MS, FTIR, NMR, AAS. Flurimetry, X-ray diffraction, Radio isotope techniques, GM Counter and Scintillation Counter. Gel electrophoresis, isoelectric focusing and immune electrophoresis, capillary electrophoresis, pulse field electrophoresis.

UNIT - V

Bioinformatics and IPR - An overview of bioinformatics. Genbank sequence data bases - NCBI, EMBL, DDBJ - retrieving database entries. Sequence alignment and database searching - FASTA, BLAST - Phylogenetic analysis Genomics, Proteomics. Drug design and commercial bioinformatics. Intellectual property rights, patents, trade secrets, copyrights and trade mark. Patenting transgenic organisms. Plant breeder's right. Ethics in animal biotechnology.

References

1. Petter Laake, Haakon Breien Benestad and Bjorn Reino Olsen (2007) *Research Methodology in the Medical and Biological Sciences*, Academic Press.
2. Bajpai, S. (2006) *Biological instrumentation and methodology*, Chand & Company Ltd., New Delhi,
3. Jeffrey, A.W. and Myra, L.S. (2002) *Statistics for the Life Sciences*, 3rd Edition, Prentice Hall.
4. Attwood, T.K. and Parry-Smith, D.J. (2001) *Introduction to Bioinformatics*, Pearson Education, Asia.
5. Subbaram, N. (2003) *Patents*, Pharma Book Syndicate, Hyderabad.
6. Glick, B.R. and Pasternack, J.J. (1998) *Molecular Biotechnology*, 2nd Edition, ASM Press, Washington, DC.
7. Recombinant DNA safety guidelines (1990) Department of Biotechnology, Ministry of Science & Technology, Government of India, New Delhi.
8. Revised guidelines for research in Transgenic plants (1998) Department of Biotechnology, Ministry of Science & Technology, Government of India, New Delhi.
9. Webster, J.G. (2004) *Bioinstrumentation*, Student Edition. John Wiley and Sons.
10. Wilson, K. and Walker, J. (2003) *Practical Biochemistry Principles and Techniques*, 5th Edition. Cambridge University Press.
11. Gurumnani, N. (2006) *Research methodology for biological sciences*, 1st Edition, MJP Pubsihers. A unit of Tamilnadu Book House, Chennai.
12. Glantz, S.A. (2001) *Primer of Biostatistics*, McGraw-Hill.
13. Rosner, B. (1999). *Fundamentals of Biostatistics*, Duxbury Press.
14. Motulsky, H. (1995) *Intuitive Biostatistics*, Oxford University Press.
15. David W.M. (2001) *Bioinformatics, Sequence and Genome Analysis*, Cold Spring Harbor Laboratory Press.
16. Higinns, D. and Taylor, W. (2000) *Bioinformatics, Sequence, Structure and databanks - A Practical Approach*, Oxford University Press.
17. Baxevanis, A.D. and Francis Ouellette, B.F. (2001) *Bioinformatics - A Practical Guide to the Analysis of Genes and Proteins*, Wiley-Interscience.
18. Gibson, G. and Muse, S.V. (2002) *A Primer of Genome Science*, Sinauer Associates, Inc. Publishers.
19. Misener, S. and Krawetz, S.A. (2000) *Methods in Molecular Biology* (Vol 132), Humana Press.

20. Claverie, J.M. and Notredame, C. (2003) *Bioinformatics for Dummies*, Wiley Publishing, Inc.

Web References

1. <http://www.newagepublishers.com/samplechapter/000896.pdf>
2. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/ln_research_method_final.pdf
3. <http://www.math.yorku.ca/scs/statResource.html# General>
4. <http://www.anest.ufl.edu/computer/index.html>
5. <http://www.jegsworks.com/Lessons/index.html>
6. <http://www.bettycjung.net/statsites.html>
7. <http://www.biostat.harvard.edu/links/>
8. <http://www.ped.mod.utah.edu/genpedscrr/Epibio.html>.

PAPER – II: ADVANCES IN MICROBIOLOGY

Course Objectives

The course contents are designed to gain knowledge about the various advances that have been made in the field of microbiology with regard to the instrumentation used in research and advanced science knowledge with regard to microbial technology, secondary metabolites, clinical microbiology and microbial pharmaceuticals.

Course Outcome

At the ends of the course, learners will be able to

1. Gain knowledge to the advanced microbial techniques and effectively learn the applications of the instruments.
2. Acquire knowledge of the various secondary metabolites production and their biological applications.
3. Understanding the importance of various emerging diseases and its diagnostic methods.
4. The students will be able to know about the advanced developments in Microbiology.

UNIT - I

Microbial techniques: Confocal microscopy, DNA Microarray for comparative and Evolutionary genomics: Flow cytometry: Photo and Video Micrography and Autoradiography. Atomic flame photometry, Plasma emission spectroscopy, Infra-red spectrophotometry. Tandem mass spectroscopy, Electron Spin Resonance spectroscopy, MOLDI-TOF mass spectrometry.

UNIT - II

Current trends: Exploration of bioactive compounds from extremophiles. Bioremediation, Biosensors, Biofuel, Biofilms. Remote sensing microbiology, Microbial communication - Quorum Sensing. Barcoding of microbes - application in clinical and industrial fields,

UNIT - III

Microbes and Health: GLP, laboratory and hospital acquired infection. Emergence of MDR and XDR microbes. Harmful microbes and biological weapons. Automated diagnostic method. Recombinant vaccines. Environmental aspects of emerging diseases.

UNIT - IV

Microbial Technology: Microbes in nanotechnology, Applications in tissue engineering and therapeutics. Biopolymers, Biosurfactants, Biofertilizers, Biopesticides, Bioluminescence, Genetically modified organisms. Gene therapy, Stem cell therapy. Carbon sequestration by microbes.

UNIT - V

Microbial pharmaceuticals and biotechniques: Drug discovery and design, British and Indian Pharmacopoeia, Marine microbial antibiotics, Microbial therapeutic enzymes, Microbial pigments, Single cell proteins. Microbial Products and their bioprocesses.

References

1. Dana M. Santos (2011) *Recent Advances in Microbiology*, CRC Press.
2. Paul Singleton and Diana Sainsbury (2001) *Dictionary of Microbiology and Molecular Biology*, Wiley.
3. Jawetz, E., Melnick, J.L. and Adelberg, E.A. (1998) *Review of Medical Microbiology*, 19th Edition, Lange Medical Publications, ELBS, London.
4. Chakraborty, P. (2003) *A text book of Microbiology*, 2nd Edition, Published by New central book agency (P) Ltd., Kolkata.
5. Glick, B.R. (2003) *Molecular Biotechnology - Principles and Applications of Recombinant DNA*, 3rd Edition, ASM Press, Washington DC.
6. Jognand, S.N. (2004) *Gene Biotechnology*, Himalaya Publishing house, Mumbai.
7. Webster, J.G. (2004) *Bioinstrumentation*, Student Edition, John Wiley and Sons Pvt Ltd., University of Wisconsin.
8. Palanivelu, P. (2001) *Analytical Biochemistry and Separation Techniques - A Laboratory Manual*, 2nd Edition, Tulsii book centre (Publication), Madurai, Tamilnadu.
9. Young, M.M. (2004) *Comprehensive Biotechnology, The Principles, Applications and Regulations of Biotechnology in Industry, Agriculture and Medicine*, Vol 1, 2, 3 and 4. Elsevier India Private Ltd, India.
10. Prave, P., Faust, U., Sittig, W. and Sakatsch, D.A. (2004) *Fundamentals of Biotechnology*, Panima Publishing Corporation, India.
11. Mansi, E.M.T.E.L. and Bryle, C.F.A. (2002) *Fermentation Microbiology and Biotechnology*, Taylor & Francis Ltd, UK.
12. Crueger, W. and Crueger, A. (2000) *Biotechnology: A Textbook of Industrial Microbiology*, Panima Publishing Corporation, India.

Web References

1. <http://gsbs.utmb.edu/microbook/toc.html>
2. http://www.dli.gov.in/rawdataupload/upload/insa/INSA_1/2000c4de_31.pdf
3. http://www.gonda.ucla.edu/bri_core/confocal.htm
4. <http://www.biosci.ohio-state.edu/-mgonzalez/micro521.html>
5. <http://bioweb.uwlax.edu/Genweb/Microbiology/General/general.html>
6. <http://www.medunich.edu/TAMC/LINKS.HTML>
7. <http://acs.ucalgary.ca/-browder/transgeni.html>