

# MANGALORE UNIVERSITY

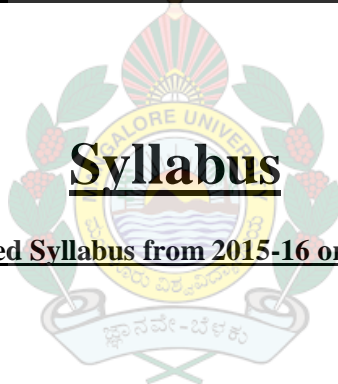
**Department of Studies and Research in Microbiology**

**PG Centre Jnana Kaveri, Chikka Aluvara**

**Kodagu-571 232**

Programme:

## **PH.D. COURSE WORK IN MICROBIOLOGY**



**Revised Syllabus from 2015-16 onwards**

### **Programme Outcome:**

The Ph.D programme course work and syllabus build confidence, augment candidate's capacity to address societal problems, and frame objectives. Also, by gaining theoretical knowledge of literature survey students are made able to write research specific review of literature and format reports. Candidates equip with problem solving capacity by understanding techniques and technology in Microbiology.

### **Programme Specific Outcome**

**PSO 1:** Generation of human resource trained with microbial techniques and principles

**PSO 2:** Trained manpower in various specific field of Microbiology

**PSO 3:** Importance of publications with respect to quality, rules of publications processes, citations, journal lists

**PSO 4:** Understanding on IPR and patent procedures

**PSO 5:** Knowledge on construction and working principles of microbiological equipments such as Microscopy, Spectroscopy, Chromatography, Centrifugation, Electrophoresis

**PSO 6:** Laboratory designing, good laboratory practices and Bio-safety levels

### SCHEME OF EXAMINATION

Paper	Particulars	Hours of Instruction per Week	Duration of Exam (hrs)	Marks			
				IA	Theory	Total	Credits
Paper - I	Research Methodology	4	3	30	70	100	4
Paper - II	Review of Literature	16	-	-	-	-	-
	Review Report	-	-	-	-	150	8
	Viva	-	-	-	-	50	2
							14

#### Evaluation of the course consists of

1. Theory exam for 3 hours duration for 70 marks
2. Internal Assessment for 30 marks (written test/ submission of assignments/ seminar presentation)

**Question paper pattern:**

**MANGALORE UNIVERSITY**  
**PH.D COURSE WORK EXAMINATION MONTH-YEAR**  
**SUBJECT: MICROBIOLOGY**  
**PAPER-1: RESEARCH METHODOLOGY**

**Time: 3 HOURS**

**Max. Marks: 70**

**PART-A**

**I. Answer any FIVE of the following**

**2x5=10**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

**II Answer any SIX of the following**

**5x6=30**

- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.
- 16.



**PART-C**

**III. Answer any THREE of the following**

**10x3=30**

- 1.
- 2.
- 3.
- 4.

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**Paper II: Review of literature and Viva**

Submission of Review of literature report

Presentation/viva by doctoral committee

Max. Marks: 150

Max. Marks 50

## PAPER-1: RESEARCH METHODOLOGY

### Course Outcome

**CO 1:** Identification of problem, hypothesis, framing objectives

**CO 2:** Literature survey, report writing, formats of writing

**CO 3:** Practical approach to advanced tools and techniques in microbiology

**CO 4:** Knowledge and implications of Data collections, data analysis, tests of significances

**CO 5:** Applications of computers and software's in microbiological analysis, statistical analysis

**CO 6:** Internet, Literature search techniques, citations, H index

**CO 7:** Bioinformatics, Sequence analysis, NGS

### UNIT 1: Research Methodology

**12hr**

Introduction, Scope, Identification of problem, Formulation of Research Objectives, Hypothesis Testing, Components of research design, Good Laboratory practices, Bio-Safety level, Laboratory designing

Intellectual Property Rights, Patent Laws, Patenting of Microorganisms

Bioethics, Institutional Ethics Committee, Model/Experimental Organisms: *E. coli*, *Drosophila melanogaster*, *Coenorhabditis elegans*, *Arabidopsis thaliana*, Mouse, Rat, Guinea pig, Rabbit, CPCSEA Guidelines- Maintenance, Handling, Treating and Collection of Biological Samples and Waste disposal.

Literature Survey and Review: Report writing, Pre-writing considerations, Thesis writing, Formats of Report writing, Formats of Publications in Research Journals.

Plagiarism: Tools and Software for detection

### UNIT 2: Advanced Tools and Techniques

**18hr**

Microscopic techniques: Electron microscopy, Confocal Microscopy, Fluorescent Microscopy, Live Cell imaging,

Chromatography: Principle, protocols and application of GLC, HPLC

Electrophoresis: 2D Gel Electrophoresis, PFGE, DGGE, Western, Southern and Northern Blotting

Spectroscopy: Principles and Applications of UV-Visible, Mass Spectroscopy, LC-MS, NMR Spectroscopy, MALDI-ToF

Isotopes in Research: Radio Labeling, Autoradiography, radioimmunoassay, Use of Radioisotopes in Microbiological Research

Immunological Techniques: Precipitation, ELISA, Immunohistochemistry, Immunofluorescence

Molecular Analysis: PCR, Real Time PCR, DNA Microarray, DNA Sequencing, Cloning and Expression Vector, Construction of vector, Construction of Vectors, Whole DNA-methylome

Protein Microarray and Protein Sequencing

Nano-Technology: Microbial Nanoparticles; Principles and Applications

### UNIT 3: Quantitative Data Analysis

**06hr**

Data Collection: Types, Methods and Tools

Normal, Binomial, distributions: Properties and Significances.

Test of Significances: Student *t*-test, F-test, Chi-square test,

Correlation and regression, ANOVA, Multiple-range test.

#### **UNIT 4: COMPUTER APPLICATIONS**

**12hr**

Introduction to Spread Sheet Application, Features and Functions, using Formula and Functions, Data sorting, Generation Charts/Graphs and other features, Molecular modelling Presentation Tools: Features and Functions, Creating and Customizing Presentation.

ICT: Meaning, Advantages and Uses.

Basics of Internet, Search Engines and Advanced Search Techniques, JIF, JCI and Citation Search, H-index, Literature search techniques.

Statistical Data Analysis using Computers and Software; TOOLPAK, COSTAT, SPSS.

Microbial Sequence Analysis: Using Bioinformatics tools; BLAST, EMBL, GENE BANK, PDB Next Generation Sequencing Methods.

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#### **References**

- Kothari, C.R., 1985, Research methodology-Methods and techniques, Newdelhi, Wiley Eastern Limited.
- Das, S.K.,1986, An introduction to Research, Kolkata, Mukherjee and Company Pvt.Ltd.
- Misra R P.,1989, Research Methodology:A handbook, Newdelhi, Concept publishing company.
- Kumar R., 2005, Research methodology-A step-by-step guide for beginners, (2<sup>nd</sup> ed.), Singapore, Pearson education.
- Bhattacharya, D.K., 2006, Research methodology, (2<sup>nd</sup> ed.), Newdelhi, Excel books.
- Panneerselvam R., 2012, Research Methodology, Newdelhi, PHI Learning Pvt. Ltd.
- Khan, Irfan Ali, 2008, Fundamentals of biostatistics, Ukaaz publications.
- Rosner B.A., 2011, Fundamentals of biostatistics, Cengage learning.
- Katz.J.M., 2009, From research to Manuscript: A guide to scientific writing, USA, Springer science.
- Saravanavel, P., 1990. Research methodology,Allahabad, kitabmahal.
- Rastogiand Sani., Microbes and Microbial technology, 2011, pp 29-57, Molecular techniques to assess microbial community structure, function and dynamics in the EMnvironment.
- A K Beg and M H Mahbubani., Applications of the polymerase chain reaction in environmental. Microbiology Res. 19921 : 151-159.
- The Metagenomics of soil by Rolf Daniel, 470/june 2005/vol 3.
- Metagenomics: DNA Sequencing of Environmental samples, Susannah green tringe and Edward M. Rubin, 806/November 2005/volume 6.
- Persing, H.D. *et al.* 2004, Molecular Microbiology : Diagnostic principles and practice, Washington D C., ASM Press.
- Chandler D.E. and Roberson R.W. 2009, Bioimaging: current concept in light and electron microscopy,Singapore, Jones and Bartlett Publishers.
- Muralidharan V.S. and Subramania A.2010, Nanoscience and technology, New Delhi Ane books Pvt.Ltd .
- Scott R.P.W.2012, Principles and practice of Chromatography (chrom- Ed book series) , Reese-Scott partnership.
- Miller J.M., 2009, Chromatography: Concepts and Contrasts, USA, John Wiley and Sons, Inc.
- Banwell, C.N. and McCash, E.M.,2012,Fundamentals of molecular spectroscopy, 4<sup>th</sup> Ed., New Delhi, Tata McGraw Hill Education Pvt.Ltd.

- Braun R., Introduction to Instrumental Analysis, Newyork, McGraw Hill book Company.
- Rodney F.Boyer- Modern Experiemental Biochemistry - 3<sup>rd</sup> Edition- 2000
- Bioinformatics Methods and Applications Genomics, Proteomics and Drug Discovery (S.C. Rastogi , N. Mendiratta and P. Rastogi)
- Introduction to Bioinformatics, (Atwood, T.K. and parry – smith D J ).
- The search for Bioactive compounds from Microorganisms by S Omura.
- Annal reviews in Microbiology volumes 46 and 48 by L. N. Ornston, a balows and E P Greenberg (eds). Academic press.
- Advances in applied Microbiology volumes 6, 10, 17 by D. Perlman and umbreit (eds). Academic press.
- Sambrook J, Fritsch E.F. and maniatitis (1999) Molecular cloaning, volume I, II,III 2<sup>ND</sup> edition, Coldspring harbor laboratory press, Newyork
- DNA Cloaning : A practical approach D.M. Glover and D.B. Hames, R L Press, Oxford 1995.
- Molecular and cellular method in biology and medicine, P.B. Kaufman, W. Wu, D. Klim and L.J. Cseke , CRC press Florida 1995.
- Methods in Enzymology guide to Molecular Cloaning techniques, vol.152 S.L. Berger and A .R. Kimmel, academic press inc, Sam Diego 1996.
- Methods in Enzymology gene expression technology, vol. 185 D. Goedel, academic press Inc, san diego, 1990.
- DNA science : a first course in Recombinant technology,D.A.Mickloss and G.A. Freyer, cold spring Harbor Laboratory press, New York,1990
- Genetic engineering : An Introduction to Gene analysis and Exploitation in Eukaryotes, S.m. Kingsman, Blackwell Scientific publications, oxford,1998.
- Kuby: immunology; RA goldsby,Thomas J. Kindt, Barbara A. Osborne
- Developing bioinformatics computer skills (Cynthia Gibas and Per Jambeck).

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