DEPARTMENT OF MICROBIOLOGY

COURSE STRUCTURE & SYLLABI

(For the students admitted from year 2023-2024 onwards)

Programme : M.Phil. Microbiology

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TIRUCHIRAPPALLI – 620 020

M.PHIL. MICROBIOLOGY

Sem	Course Code	Course Category	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
						CIA	ESE	
I	23MPMB1CC1	Core - I	Research Methodology	4*	4	25	75	100
	23MPMB1CC2	Core - II	Applied Microbiology	4*	4	25	75	100
	23MPMB1CC3	Core - III	Teaching and Learning Skills (Common Paper)	4*	4	25	75	100
	23MPMB1CC4	Core - IV (Elective)	Paper on Topic of Research (The syllabus will be prepared by the guide and examination will be conducted by the COE)	4*	4	25	75	100
		*One hour library for each course						
			Total	**16**	**16**			**400**
II	23MPMB2PD		Dissertation#	-	8	-	200	200
			Grand Total	**16**	**24**			**600**

 # Evaluation of the Dissertation Viva voce shall be made jointly by the Research Supervisor and the External Examiner.

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPMB1CC1	Core – I	4	4	25	75	100

Course Title	RESEARCH METHODOLOGY

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Scientific writing concepts**: Definition of Research, Qualities of Researcher, Components of Research Problem, Various Steps in Scientific Research, Types of Research; *Hypotheses of Research Purposes* - Research Design - Survey Research - Case Study Research. Sources of Data: Primary Data, Secondary Data, Procedure Questionnaire - Sampling Merits and Demerits.	12
II	**Preparation of Dissertation**: Structure and Components of Research Report, editing of final thesis, Research data analysis- Table, Pictures and Graphs. *Plagiarism*, Formatting and Bibliography, Preparation of research manuscript. Research ethics- H-index, i10 index, Impact factor.	12
III	**Writing Research Proposal:** Identify the research problem, research hypothesis, aim and objectives, background and outcomes. Preamble, study design, methods, and analysis of data, *displaying result in tables, graphs and charts*. Submission of project reports, Guidelines of publications in Research journals. Research proposal Grant- structure, budget allocation, specific aims, background and significance. Hierarchy of funding agencies in India and their operations	12
IV	**Biological instrumentation**: Basic Principles and applications of Centrifugation-Preparative, Analytical and Density gradient centrifugation. Confocal, Fluorescent and Electron Microscopy. Spectroscopy techniques- UV-Visible Spectrophotometer, FT-IR, NMR and XRD. Chromatographic Techniques-Theory and application of *GC-MS Chromatography* and HPLC. Electrophoresis: methods and application of Agarose, SDS PAGE, 2D-Gel electrophoresis, #MALDI-TOF and Pulse Field gel electrophoresis (PFGE)#.	12
V	**Bioinformatics and Biostastics:** Genbank: ASN.1, GCG, FASTA, EMBL, NBRF, PIR, SWISSPROT sequence formats, PDB format - NCBI, EMBL, DDBJ, UniGene, SGD, EMI Genomes. protein databases-PIR, SWISSPROT, TrEMBL, Prosite, PRINTS. Structural databases- PDB, SCOP and CATH. **Biostatistics:** Definition, Types of biological data, *Representation of biological data*. Measurement of central tendency; Measurement of dispersion; Data analysis – Student's t-test, Chi-square test, F-test, ANOVA, Correlation and Regression, Probability.	12
VI	**Current Trends (For CIA only) -** The gut microbiome and early-life growth in a population with high prevalence of stunting.	

……. Self Study

Text Book(s):

1. Arunima Kumari, An Introduction to Research Methodology, Agrotech Publishing Academy, Udaipur, 2008.

2. N.Gurumani, Research Methodology for Biological Sciences, MJP Publishers, 2006.

3. Keith Wilson and John Walker, Practical Biochemistry - principles and techniques, Cambridge Press, New York, 1994.

4. David W Mount, "Bioinformatics: Sequence and Genome Analysis", 2^{nd} Edition, CBS Publishers, 2004.

5. A. Irfan , Khan and Atiya Khanum. Fundamental of Biostatistics, Ukaaz publishers, India,1994.

Reference Book(s):
1. C.R.Kothari, Research Methodology, Wiley Eastern Ltd., New Delhi, 1988. 2. L.R.Patki, L.Bhalchandra and I.H. Jeevaji, An introduction to microtechniques, S. Chand and Company Ltd., New Delhi, 1989. 3. S.R.Pennington and M.J. Dunn. "Proteomics from Protein Sequence to Function", Viva Books Ltd, 2002. 4. J.M.Wrigglesworth, Biochemical research technique - a practical introduction. John Wiley, New York,1984. 5. N.T. J. Bailey, Statistical Methods in Biology, English Univ. Press, 2010.
Web Resource(s):
1. https://www.academia.edu › Basic_Concepts_of_Research_Methodology 2. https://www.scribbr.com › Knowledge Base › Starting the research process 3. https://www.slideshare.net › vikasindian001 › research-report-ppt 4. https://en.wikipedia.org › wiki › Biomolecule 5. https://www.slideshare.net › biinoida › bioinformatics

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Explain the basic concepts of Research Methodology	**K2**
CO2	Collect the formats of publications in Research journals.	**K3**
CO3	Evaluate the of impact factor and plagiarism	**K4**
CO4	Explain the different types of microscopes, spectroscopic and chromatographic Techniques.	**K5**
CO5	Compile the Principles and applications of electrophoretic techniques.	**K6**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	1	2	2	3	2	2	2	2	2.1
CO2	2	2	3	2	1	2	3	2	2	1	2.0
CO3	2	3	1	2	2	3	2	3	2	2	2.2
CO4	3	2	2	2	1	2	2	1	2	2	1.9
CO5	2	2	2	1	2	3	2	2	2	1	1.9
Mean Overall Score											**10.1/5=2.02**
Correlation											**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. H. Vajiha Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPMB1CC2	Core – II	4	4	25	75	100

Course Title	**APPLIED MICROBIOLOGY**

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Strategies in Bioconversion:** Utilization of farm wastes and residues in agriculture – Microorganisms as a source of nutritive protein– SCP and Mushroom. Bioconversion of lignocelluloses into protein – rich food and feed. *Composting of organic wastes, Production of biogas*. Bioengineering approaches to the bioremediation of compostable wastes- Microbial characteristics of composting process, Compost systems - Batch and continuous. Approaches to Bioremediation. Environmental pollutants.	**12**
II	**Vaccines Preparation and chemotherapeutic drugs:** Vaccines; Vector vaccines; Naked DNA Vaccines; Biosynthetic and Chemically Synthesized vaccines; Subunit vaccine; Anti Idiotype vaccines; Combination vaccines, Polynucleotide as vaccines. Preparation of Hepatitis B vaccine and Tissue Culture derived rabies vaccine and AIDS vaccine. *Properties and mode of action of Antibacterial drugs: Sulpha drugs, Penicillin*, Cephalosporin, Streptomycin, Tetracycline, Chloramphenicol.	**12**
III	**Genetic Engineering of Microbes**: Methods for the genetic manipulation of Bacilli- gene expression. Genetic engineering of *Streptomyces* – methods of gene manipulation – gene expression –use of *Streptomyces* as a host for excretion of heterologous products. *Genetic Engineering of Filamentous fungi for industrial application - antibiotics and enzymes*.	**12**
IV	**Microbes in Food industry**: Starter cultures and their biochemical activities. Production and application of Bakers Yeast, Bread, Cheese, Yoghurt and Soy sauce fermentation by Moulds. Fermented vegetables – Sauerkraut. Fermented Meat – Sausages Fermented beverages: Vinegar, Beer and wine. Application of microbial enzymes in food industry. *Genetically modified foods*.	**12**
V	**Enzyme Immobilization:** Immobilization of Microbial enzymes- Properties, Methods, membrane confinement and their analytical, therapeutic and industrial applications. *Microbial enzymes in textile, leather, wood industries, and detergents*.	**12**
VI	**Current Trends (For CIA only) -** Multidrug resistance, Beta-lactamases in antibiotic resistance.	

……. Self Study

Text Book(s):

1. C.F. Forster and D.A. John Wase, Environmental Biotechnology. Edited by Ellis Horwood Ltd. Publication, 2008.
2. L. M. Prescott, John P. Harley and A. Donald Klein, Microbiology, 8th edn McGraw Hill Publishing company Ltd, 2011.
3. N.S. Subba Rao, Advances in agricultural microbiology. Oxford and LBH publishing Co, 1982.
4. A.M Atlas and R. Bartha. Microbial ecology. Fundamentals and applications. An imprint of Addison Wesley Longmann Inc, 1998.

Reference Book(s):

1. B.William Jakoby. Methods in Enzymology: Enzyme purification and related techniques.Edited by Academic Press, New York, 1988.
2. R.W. Old and S.B. Primbrose, Principles of gene manipulation-An introduction to genetic engineering. 5th edition. Blackwell scientific publications. London, 1995.
3.J. Soli Arceivala. Waste water treatment for pollution control. 2nd edition. Tata McGraw Hill publishing company Ltd, 1998
4. San Diego. Biodegradation and Bioremediation. Academic Press, 2009.
5. G. Gregory, Vaccines: New generation Immunological Adjuvants. Series A: LifeSciences, 1995.

Web Resource(s):
1. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/bioconversion 2. https://www.who.int/vaccine_safety/initiative/tech_support/Vaccine-safety-E-course-manual.pdf 3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5672523/ 4. https://www.researchgate.net/publication/47680774_Genetic_Manipulation_of_Streptomyces_Species 5. http://www.fao.org/3/mg309e/mg309e.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the knowledge and skill in sustainable microbial technologies.	**K2**
CO2	Apply the depth of theoretical knowledge in vaccine development.	**K3**
CO3	Illustrate the mechanisms of gene expression in bacteria and fungi.	**K4**
CO4	Summarize the applications of microbial enzymes in food industry	**K5**
CO5	Report the biomedical applications of immobilized enzyme.	**K6**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**2**	**1**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**1**	**1.9**
CO2	**3**	**3**	**1**	**2**	**1**	**3**	**3**	**2**	**2**	**2**	**2.2**
CO3	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**2.2**
CO4	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**1**	**2.1**
CO5	**2**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2.0**
Mean Overall Score											**10.4/5= 2.08**
Correlation											**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. H. Vajiha Banu

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPMB1CC3	Core – III	4	4	25	75	100

Course Title	TEACHING AND LEARNING SKILLS

SYLLABUS		
Unit	Contents	Hours
I	**Computer Application Skills:** Internet –meaning – importance-types of networking-LAN, WAN, MAN-internet- website and webpage's, internet connectively – Browsing the internet-Browsing software-URL addresses, search engines, exploring websites and downloading materials from websites, power point-creating a presentation – slide preparation-popular websites for data collection in Microbiology, *MS Excel – Statistical packages – SPSS**.	12
II	**Communication and Interaction:** The theory of communication-communication cycle-Types of communication, communication and language, communication in the class room, Lecture and Lecture demonstration as communication. Interaction methods –Interaction analysis, observation schedule and record. Bale's interaction process categories – Flander's system of interaction analysis – verbal interaction category system. Reciprocal category system – *Equivalent talk categories*.	12
III	**Education Skill:** Psychology – Definition-Nature- Meaning of educational Psychology – Definition – Nature – Scope. Teaching and learning – meaning – characteristics – effective teaching – concept of learning – comparison between teaching and learning. Mental health – Frustration – concept of adjustment – Defense mechanism – *Mental hygiene **.	12
IV	**Uses of Teaching Strategies:** Group methods of instruction – lecture – demonstration – seminars – workshops – case analysis – panel discussion – team teaching - individual approaches – Teleconferencing – ***Video conferencing*** – Description – Advantages – Micro teaching – Characteristics of Micro teaching – Teaching skills – Programmed Instruction – ICT enabled teaching – Language Laboratory.	12
V	**Educational Technology:** Educational technology – definition – objectives – teaching technology – characteristics of teaching technology –behavioral technology – pedagogy of teaching – General advantage of using teaching aids – Broad classification of teaching aids – *****Hardware and software in teaching aids***.** Instructional media – media attribution – multimedia and instructional development – Multimedia centre – uses and abuses of multimedia.	12
VI	**Current Trends (For CIA only) -** Learning development Trends : Rapid digital learning, Microlearning, Adaptive learning.	

……. Self Study

Text Book(s):
1. S.K. Kochhar, Methods and Techniques of Teaching, Sterling Publisher Pvt. Ltd. Publications New Delhi, 2004. **2.** P.Sambasiva Rao and D. Bhaskar Rao, Techniques of Teaching Psychology, 2006. **3.** K.Sampath, A. Panner selvam and S.Santhanam. Introduction to Educational Technology, 4^{th} ed., Sterling Publisher Pvt. Ltd, 2000.
Reference Book(s):
1.R.A.Sharma, Educational technology and management models media and methods. R. Lall Book Depot. Meerut, UP, 2007. 2. T.M.Srinivasan, Use of Computers and Multimedia in Education –Aavisakar Publication, Jaipur, 2002. 3. M.Vanaja, Educational technology –Neel Kamal Publication Pvt. Ltd. Hyderabad, 2004. 4. Zikr–ur Rahman, Modern teaching methods and techniques — Anmol Publication Pvt. Ltd. New Delhi,2006. 5. S.Robinson, Fundamentals of Education Psychology, 2^{nd} ed - Ane Books Pvt. Ltd, 2008.

Web Resource(s):
1. https://en.wikipedia.org/wiki/Learning_management_system. 2. https://www.slideshare.net › Vijirayar › communication-and-interaction- 3. https://www.slideshare.net › maheshjajulwar › life-skill-education-50942560. 4. https://www.slideshare.net › joselinesantos3 › selection-and-use-of-teaching. 5. https://en.wikipedia.org › wiki › Educational technology.

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the importance of computer and its application.	**K2**
CO2	Explain how to use instructional technology effectively in a classroom.	**K3**
CO3	Plan the effective teaching and learning.	**K4**
CO4	Summarize the skills of ICT and apply them in Teaching Learning context and Research.	**K5**
CO5	Create the skills on behavioural technology and pedagogy of teaching.	**K6**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	1	2	2	3	2	2	2	2	2.1
CO2	2	2	3	2	1	2	3	2	2	1	2.0
CO3	2	3	1	2	2	3	2	3	2	2	2.2
CO4	3	2	2	2	1	3	2	1	2	2	2.0
CO5	2	2	2	1	2	3	2	2	2	1	1.9
Mean Overall Score											**10.2/5= 2.04**
Correlation											**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. H. Vajiha Banu