DEPARTMENT OF BIOCHEMISTRY
PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM - 636 011

M.Phil Biochemistry Syllabus

(Candidates admitted from 2018-2019 onwards)

M.Phil. BIOCHEMISTRY SYLLABUS

(Candidates admitted from 2018-2019 onwards)

Full Time

1. Eligibility for admission

Candidate who have qualified for post graduate degree in Biochemistry or Biological Science of any recognized university shall be eligible to register for the Degree of Master of Philosophy (M.Phil) in Biochemistry.

For full-time M.Phil registration, candidates shall be required to have obtained a minimum of 55% marks .except for whom have qualified their P.G degree on or before 1st January 1991 and those who have qualified for the Masters Degree before 01.01.91.

In case of teacher or other candidates registering for part –time M.Phil candidates belonging to SC/ST community, the minimum percentage of marks for registration is 50%.

2. Duration

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

3. Structure of the Course

The course of study for the degree shall consist of Part –I comprising three written papers according to the Syllabus prescribed from time to time. Part I shall consist of Paper I Research Methodology and Paper II Analytical Technique. Paper III shall be the guide paper relating to the proposed Dissertation.

Part	Course	Course code	Name of the Course	Credits	Marks
I	I	18MPBC01	Research Methodology	4	100
	II	18MPBC02	Analytical Techniques	4	100
	III	18MPBCE01	Guide Paper	4	100
II	IV	18MPBCD01	Dissertation and Viva voce	12	200
		Total		24	500

4. Scheme of Examination

Part –I : Written Examination (Papers I, II and III)

The examination of paper I, II and III shall be held at the first six months. The duration for each paper shall be 3 hours.

Paper – III examination will be conducted by the University along with paper I and II.

Part II : Dissertation

The broad area of research shall be intimated within 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 he University from a panel of four names sent by the Supervisor through the Head of the Department/ at the time of submitting the Dissertation.

Submission or resubmission of the Dissertation will be allowed twice a year. On receipt of satisfactory evaluation reports, the student shall undergo a Viva-voce Examination.

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	: 150 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

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.

A candidate shall be declared to have passed Part-II of the examination if his/her scores 50% of the marks in the Dissertation as well as Viva-voce. 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 two years from the date of commencement of the course. The University may grant extension of time for not more than one year on the recommendation of his/her supervisor for submission of dissertation only.

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 Part I and Pat II of the examinations as per the regulations.

The Degree and provisional certificate certifying that the Degree has been awarded in accordance with the provisions of 2016 regulations of the UGC.

18MPBC01

RESEARCH METHODOLOGY

UNIT I

Scientific Research

Overview of scientific research, improvement through research and applications of research. Choosing a topic and formulation of hypothesis. Designing and investigation techniques to be employed, analysis of results. Use of microorganisms, animals, plants and humans in experimentation.

Scientific writing – logical format for writing thesis and papers – abstract, introduction, review of literature, materials and methods, results – illustration by tables and figures, discussion, and bibliography – Harvard and Vancouver systems.

UNIT II

Bioinformatics

The scope of bioinformatics. The internet. The world wide web. File formats. Biological data bases-sequence and structure-NCBI,PDB. Data retrieval – the Entez system. Searching sequence databases – sequence similarity searches, substitution matrices. Database search-FASTA and BLAST. Protein multiple sequence alignments-CLUSTAL.

UNIT III

Biostatistics

Collection and classification of data – diagrammatic and graphic representation of data – measurement of central tendency, Measures of dispersion, Correlation and Regression analysis, Test of significance based on large samples and small samples, Student t test , Chi square test, ANOVA, DMRT, Normal distribution, Use of SPSS software.

UNIT IV

Safety, general guidelines and funding agencies

Biosafety – Introduction. Levels of Biosafety. General guidelines and practices. Guidelines for DNA research activities. General guidelines for

research in transgenic plants, Good laboratory practices. Containments – Types, Basic Laboratory and Maximum Containment Laboratory.

Research bodies & funding agencies – UGC, CSIR, ICMR, DST, DBT,ICAR, DAE, DRDO, DOD, Fellowships – Junior, Senior Research Fellowships and Research associates.

UNIT V

Bioethics and Patenting

Declaration of Bologna, Ethics in animal experimentation, CPCSEA guidelines – animal care and technical personnel, environment, animal husbandry, feed, bedding, water, sanitation and cleanliness, waste disposal, anesthesia and euthanasia.

Composition of (human) Institutional evaluation Ethical Committee (IEC) – Beneral ethical issues. Specific principles for clinical evaluation of drugs, herbal rededies and human genetics. Ethics in food and drug safety. Environmental release of microorganisms and genetically engineered organisms. Ethical issues in human gene therapy, cloning and embryonic stem cell.

Patenting – definition of patent – different types of intellectual property rights, Case studies of patents (basmati rice, turmeric, neem). Product and process. Patenting multicellular organisms, Patenting and fundamental research.

Reference Books

1. Gupta,S.P. 2011. Statistical Methods, 4th Edition, Sultan Chand & Son Publishers.

2. Lesk, A.M. 2002. Introduction to Bioinformatics, Oxford University Press.

3. Kothari C.R. 2013. Research Methodology : Methods and Techniques, 3rd Edition, New Age Publishers

4. Day.R.A. 1989. How to write and publish a scientific paper. 3rd Edition, Cambridge University Press.

5. CPCSEA Guidelines for Laboratory Animal Facility.

6. Ethical guidelines for Biomedical Research on human subjects. ICMR, New Delhi, 2006.

7. Cooray. P.G. Guide to scientific and technical writing.

18MPBC02

ANALYTICAL TECHNIQUES

UNIT I

Spectroscopy and Centrifugation

Principle, instrumentation, and applications of UV-visible spectrophotometry, Vibrational spectroscopy, NMR, ESR, Spectrofluorimetry and luminometery. X-ray diffraction. Atomic spectroscopy – principle and applications of atomic flame and flameless spectrphotometry. Uses of LASER for spectroscopy.

Principle, instrumentation and applications of centrifugation. Preparative ultracentrifugation – differential centrifugation, density gradient centrifugation (rate-zonal & isopycnic). Analytical ultracentrifugation – molecular weight determination.

UNIT II

Chromatography and Electrophoresis

General principles, instrumentation and applications of chromatography – TLC, GLC, HPLC, ion exchange, molecular exclusion, affinity chromatography.

General principles and instrumentation. Electrophoresis of proteins – native gels, gradient gels, SDS Page, Isoelectric focusing, 2-D PAGE, Detection, estimation and recovery of proteins in gels. Western blotting. Electrophoresis of nucleic acids – agarose gel electrophoresis, DNA sequencing gels, pulsed – field gel electrophoresis, capillary electrophoresis.

UNIT III

Radiation and Immunotechniques

Principles and applications of tracer techniques in biology. Radiation hazards, prevention and safety measures. Detection and measurement of radioactivity, immunofluorescence, flow cytometry, phosphoimaging, solid and liquid scintillations counting – Cerenkov radiation. Autoradiography.

Production and applications of antisera and monoclonal antibodies, Antigen – antibody interaction – precipitation reaction, immunodiffusion, immunoelectrophoresis, immunofluorescence. RIA and ELISA – hormonal assay. HLA typing. Lymphocyte isolation and complement fixation. Immunohistochemistry, immunoelectron microscopy.

UNIT IV

Molecular Biology Techniques

Preparation of probes, Sequencing DNA – Maxam and Gilbert method, Sangers method, Next generation sequencing, Blotting techniques – Southern, Northern and western analysis. DNA finger printing, footprinting. DNA makers
– RFLP and RAPD. PCR – principle and applications – RT PCR, real time PCR In situ hybridization and FISH. DNA and protein arrays.
Genome and proteome analysis – EI – MS, MALDI, SELDI, CI & MALDI – TOF. DNA protein interaction – yeast two hybrid system, EMSA

UNIT V

Cell and Tissue Culture Plants and Animals

Animal cell and tissue culture – laboratory facilities, culture media and procedures, primary culture and cell lines, pluripotent stem cell lines, organ and embryo culture. 3D cell culture systems.

Plant cell and tissue culture media and cell culture, tissue culture, micropropagation and somoclonal variation, production and uses of haploids, protoplast culture, regeneration and somatic hybridization. Gene transfer methods in plants.

Microscopy – Principles and application of light, phase, contrast fluorescence, scanning and transmission electron microscopy, fixation and staining, Confocal microscopy, super resolution microscopy.

Reference Books

1. Wilson,K. and Walker,J. 2010. Principles and Techniques of Biochemistry and Molecular Biology, 7th Edition, Cambridge University. Press.
2. Upadhyay,A. Upadhyay,K. and Nath,N. 2016. Biophysical Chemistry: Principles and Techniques, 4th Edition, Himalaya Publishing. 11th Edition.
3. Heldt,H.W. and Piechulla,B. 2016. Plant Biochemistry, 4th Edition, Academic Press.
4. Lodish *et al*. 2012. Molecular Cell Biology, 7th Edition, W.H. Freeman and Co.
5. Brown,T.A. 2010. Gene cloning and DNA analysis: An introduction, 6th Edition, Wiley-Blackwell Publishers.
6. Owen,J.A. *et al.*, 2013. Kuby Immunology, 7th Edition, W.H. Freeman and Company.