

DEPARTMENT OF ZOOLOGY

COURSE STRUCTURE & SYLLABI
(For the students admitted from year 2023-2024 onwards)

Programme : M.Phil. Zoology



JAMAL MOHAMED COLLEGE (AUTONOMOUS)
Accredited with A++ Grade by NAAC (4th Cycle) with CGPA 3.69 out of 4.0
(Affiliated to Bharathidasan University)
TIRUCHIRAPPALLI – 620 020

M.Phil. ZOOLOGY

| Sem | Course Code | Course Category | Course Title | Ins. Hrs/Week | Credit | Marks | | Total |
|--------------------|--------------|-----------------------------------|---|---------------|-----------|-------|-----|------------|
| | | | | | | CIA | ESE | |
| I | 23MPZO1CC1 | Core - I | Research Methodology | 4* | 4 | 25 | 75 | 100 |
| | 23MPZO1CC2 | Core - II | Advances in Biological Research | 4* | 4 | 25 | 75 | 100 |
| | 23MPZO1CC3 | Core - III | Teaching and Learning Skills (Common Paper) | 4* | 4 | 25 | 75 | 100 |
| | 23MPZO1CC4 | 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 | 23MPZO2PD | | 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 | 23MPZO1CC1 | Core - I | 4 | 4 | 25 | 75 | 100 |
| Course Title | | RESEARCH METHODOLOGY | | | | | |

| SYLLABUS | | |
|----------|---|-------|
| Unit | Contents | Hours |
| I | <p>Literature survey and Thesis writing</p> <p>Research – Objectives – Types. Research Ethics – Quality of Research - Importance and Processes. Literature survey – *Printed and online journals* – Refereed journals, Impact Factor, Citation Index. Abstracts and Indices – Technical papers – Reviews – Monographs – Preparation of Index cards – Use of Internet in Literature survey. Identification and selection of Research Problem – Experimental design – Planning and execution of investigation. Preparation and Writing of Thesis: Components of thesis; Preparing of scientific papers for publication to a Journal and presenting insymposia/seminar.</p> | 12 |
| II | <p>Separation Technique</p> <p>Model organisms – culture and maintenance. CPCSEA regulations – Patent. Spectrophotometry (Principle, types, description and applications). Centrifugation (Principles, types, description and applications). Chromatography: Ion – exchange chromatography, GLCandHPLC (Principles, description and applications). Electrophoresis– Types:–PAGE, SDS-PAGE, 2D Electrophoresis. Immunoelectrophoresis – *ELISA* – Blotting techniques – Southern, Western and Northern – Principle and applications.</p> | 12 |
| III | <p>Microtechnique and Microscopy</p> <p>Microtechnique: Permanent mounting – Narcotization and Killing – fixing – washing – Tissue processing – Staining – mounting – Labeling. Histochemistry – Carbohydrate, Protein, Lipid and Nucleic acids. Microscopy: Types, *Principle and applications of Light microscopes and Electron microscopes (SEM and TEM) Studies* – Histological preparation of tissues for SEM and TEM. Photomicrography: principle and applications.</p> | 12 |
| IV | <p>Microbial Culture Techniques</p> <p>Methods in Microbiological Studies: Isolation and culture of microorganisms – mixed cultures; physical chemical and biological methods. Methods of isolationandmaintenance of pureculture. Microbial growth – *growth curve of bacteria* – measurement of growth. Culture media – characteristics – types and preparation. Staining and smearing.</p> | 12 |

| | | |
|-----------|--|----|
| V | <p>Statistical methods and tools Statistical Methods: Hypothesis testing. Tests of Significances: Student's "t" test, F-Test – One way and Twoway ANOVA with interpretation of data – Multiple comparison tests – LSD, SNK, DMRT. Correlation and regression: Correlation (Pearson's and Spearman's Rank), *partial and multiple correlation* – simple linear regression and multiple regressions. Non-Parametric Tests: Chi square, Mann Whitney "U", Wilcoxon's test and Kruskal Wallis tests. – use of SPSS for statistical analysis. #...# Self-study portion</p> | 12 |
| VI | Current Trends (For CIA only) Bioconfocol Microscopy | |

..... Self Study

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|---|
| Text Book(s): |
| Grumani, N. Research Methodology for Biological Sciences. MJP Publishers, Chennai. 2006. |
| Reference Book(s): |
| <ol style="list-style-type: none"> 1. Palanichamy, S. and M. Shunmugavelu,. Research Methodology in Biological sciences. Palani Paramount publications, Palani. 1997. 2. Anderson, D. P. Thesis and Assignment Writing, Wiley Eastern Limited. 1970. 3. Pelczar, M.J. and R.D. Reid.. Microbiology. Tata Mc Graw Hill, New Delhi. 1996. 4. De Robertis, E.D.P. and De Robertis, E.M.F.. Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt. Lid., New Delhi. 1995. 5. Das, H.K ., Text book of Biotechnology. Wiley dreamtech India Pvt Ltd., Delhi. 2005. 6. Daniel, W.W.. Biostatistics – A foundation for analysis in the Health sciences. John Wiley and Sons, New York. 2000. 7. Gupta, P.K. Biotechnology and Genomics (I Edition) Rastogi Publications, Meerut. 2004. 8. Zar, J.H. Biostatistical Analysis. Pearson Education Asia, New Delhi. 2003. 9. Dubey, R.C and Maheshwari, D.K.. A text book of microbiology. S.Chand & Co Ltd., New Delhi. 1999. |
| Web Resource(s): |
| <ol style="list-style-type: none"> 1. https://gradcoach.com/what-is-research-methodology/ 2. https://www.sciencedirect.com/topics/engineering/bioinstrumentation |

| Course Outcomes | | |
|---|--|----------------------------------|
| Upon successful completion of this course, the student will be able to: | | |
| CO No. | CO Statement | Cognitive Level (K-Level) |
| CO1 | Define and explain Research, literature survey, Journals, Impact factor, Citation index, Reviews monographs; Thesis components | K1 & k2 |
| CO2 | Apply the microbial culture technique | K3 |
| CO3 | Examine the Microtechnique procedures, tissue processing and Histochemistry; acquire knowledge on SEM & TEM, and Photomicroscopy | K4 |
| CO4 | Evaluate the use of statistical methods and tools in biological experiments | K5 |
| CO5 | Adapt the mechanism & applications of Spectrophotometry , Centrifuge, Chromatography, Electrophoresis, Blotting 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 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2.5 |
| CO2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2.6 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2.4 |
| CO4 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2.5 |
| CO5 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2.6 |
| Mean Overall Score | | | | | | | | | | | 2.5 |
| Correlation | | | | | | | | | | | Medium |

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

Course Coordinator: Dr. I. Joseph A. Jerald & Dr. M. Aneez Mohamed

| Semester | Course Code | Course Category | Hours/ Week | Credits | Marks for Evaluation | | |
|--------------|-------------|---------------------------------|----------------|---------|----------------------|-----|-------|
| | | | | | CIA | ESE | Total |
| I | 23MPZO1CC2 | Core - II | 4 | 4 | 25 | 75 | 100 |
| Course Title | | ADVANCES IN BIOLOGICAL RESEARCH | | | | | |

| SYLLABUS | | |
|----------|--|-------|
| Unit | Contents | Hours |
| I | Environmental Conservation Pollution Abatement Measures: Bioremediation – Solid Waste Management – Biofertilizers and Biopesticides – Environmental Impact Assessment (EIA) – Environmental Laws in India. Biological Diversity: Types – Genetic, Species and Ecosystem diversity – *Values of biodiversity* – Biodiversity indices: Alpha, beta and gamma – Threats to Biodiversity – IUCN Categories – Red Data Book – Conservation of biodiversity – <i>ex situ</i> and <i>in situ</i> . GPS, GIS, Remote sensing and Radio telemetry techniques used in Ecological Research – Molecular Markers in Genome analysis – RFLP, RADP, AFLP and their applications in Biodiversity | 12 |
| II | Microbiology and Microbial Techniques Microbial diversity – Prokaryote – Eukaryote and Viruses – Microbial diseases of Man – Bacterial, Fungal, Viral diseases – Chemotherapy and antibiotics – Vaccines – rDNA Vaccines – applications. Molecular mapping of genome – Genome organization. *Cloning technology and its application in biology* – Ethical issues – Terminator genes – Merits and demerits. | 12 |
| III | Immunological Techniques Antigen – Antibody interactions – Isolation of pure antibodies – Assays of complement – Assays for circulating immune complexes – Isolation of lymphocyte populations Effector cell assays, Gene targeting Immunological techniques in medical diagnosis – HIV, Hepatitis A & B, *Cancer and Pregnancy*. | 12 |
| IV | Animal Biotechnology Basictchniques of Mammalian cell cultures– Celllines– Manipulation of cultured cells and tissues – Application of Animal cell cultures – Stem cell cultures – Apoptosis – Protein Engineering – Transgenic animals – Advantages. Gene Therapy. *Human Genome Project* –DNA finger printing and its applications–Biosensors and Biochips and their Applications – Plant Biotechnology: Explants and their incubation – Regeneration of plants from callus – *Applications of Tissue culture* – Transgenic plants – IPR and Patent Rights. | 12 |
| V | Bioinformatics Scope of Bioinformatics – Genomes and Proteomes – The genome of <i>Homo sapiens</i> (the human genome). Single Nucleotide Polymorphisms. Biological Databases – Primary, Secondary, Specialized and Structural database. Databases searches for homologous sequences – FASTA, BLAST, Local and global alignment concepts – Clustal-W –*Phylogenetic trees – clustering methods*. | 12 |
| VI | Current Trends (For CIA only) Molecular Docking | |

..... Self Study

| Course Outcomes | | |
|---|--|----------------------------------|
| Upon successful completion of this course, the student will be able to: | | |
| CO No. | CO Statement | Cognitive Level (K-Level) |
| CO1 | Define and Understand environmental biology, bioremediation, conservation of biological diversity and molecular markers in Genome analysis | K1 & K2 |
| CO2 | Examine microbial techniques; cloning techniques and their application in biology | K3 |
| CO3 | Experiment the immunological techniques, cancer biology and pregnancy. | K4 |
| CO4 | Evaluate the cell culture techniques, Protein Engineering and Transgenics. | K5 |
| CO5 | Design Bioinformatics tools and Biological databases. | K6 |

| Text Book(s): |
|---|
| <ol style="list-style-type: none"> 1. Odum, E.P. Fundamentals of Ecology, W.B. Saunder's Co. Philadelphia. 1971. 2. Kumar, D and Kumar, S. Modern concepts in Microbiology, Vikas Publishing house Pvt. Ltd., New Delhi.1998. 3. Ivan Roitt, David Male and JonathamBrostoff. Immunology. Mosby Edinburgh, London. 2002. 4. Satyanarayana, U, Biotechnology, Books and Allied (P) Ltd., Kolkata. 2009. 5. Attwood, T.K. and PLarry– Smith, D.J. Introduction to Bioinformatics, Pearson Education (Singapore)2002. |
| Reference Book(s): |
| <ol style="list-style-type: none"> 1. Krishnamurthy, K.V. 2004. An advance Text book on Biodiversity. Principles and Practice. Oxford & IBH Publishing Co. Pvt. Ltd., NewDelhi. 2. Das, H.K. (Editor) 2005. Text Book of Biotechnology. Wiley Deramtech India Pvt. Ltd., New Delhi. 3. Benjamin Lewin. 1999. Genes VII. Oxford University Press, NewYork. 4. Kumar, H.D. Modern concepts of Biotechnology. Vikas Publishing House Pvt. Ltd., New Delhi. 5. Anathanarayanan, R, and C.K., JayaramamPaniker. 1990. Text book of Microbiology. OrientLondon. 6. Pelczar, M.J. and R.D. Reid. 1996. Microbiology. Tata McGrawHill. 7. De Robertis, E.D.P. and De Robertis, E.M.F. 1995. Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt. Lid., NewDelhi. 8. Lesk, A.M., 2007. Introduction to Bioinformatics (S.E.), Oxford University,Oxford. 9. Mani, K. and Vijayaraj, N., 2004. Bioinformatics. A Practical Approach, Aparnaapublications,Coimbatore. 10. Murthy, C.S.V., 2003. Bioinformatics, Himalaya Publishing House, NewDelhi. 11. Sundararajan, S. and Balaji, R. 2002. Introduction to Bioinformatics, Himalaya Publishing House, NewDelhi. 12. Westhead, D.R., Parish, T.H. and Twyman, R.M., 2003. Instant Notes: Bioinformatics BIOS Scientific Publisher Ltd, Oxford,UK. |

Web Resource(s):

1. <https://www.ncbi.nlm.nih.gov/books/NBK279395/>
2. <https://www.sciencedirect.com/topics/medicine-and-dentistry/organs-of-the-immune-system>
3. ebookpdf.com/recombinant-dna-technology
4. www.khanacademy.org › tag › pcr
5. <https://www.moscomm.org/pdf/Ananthanarayan%20microbio.pdf>
6. http://www.grsmu.by/files/file/university/cafedry/microbiologii-virysologii-immynologii/files/essential_microbiology.pdf
7. [https://www.ncbi.nlm.nih.gov/](http://www.ncbi.nlm.nih.gov/)
8. <https://pubmed.ncbi.nlm.nih.gov/>
9. <https://blast.ncbi.nlm.nih.gov/Blast.cgi>
10. <https://www.embl.org/>
11. <https://www.ddbj.nig.ac.jp/index-e.html>
12. <https://prosite.expasy.org/>

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 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2.5 |
| CO2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2.6 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2.4 |
| CO4 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2.5 |
| CO5 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2.6 |
| Mean Overall Score | | | | | | | | | | | 2.5 |
| Correlation | | | | | | | | | | | Medium |

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

Course Coordinator: Dr. I. Joseph A. Jerald & Dr. M. Aneez Mohamed

| Semester | Course Code | Course Category | Hours/ Week | Credits | Marks for Evaluation | | |
|---------------------|---|------------------------------|----------------|---------|----------------------|-----|-------|
| | | | | | CIA | ESE | Total |
| I | 23MPZO1CC3 | Core - III | 4 | 4 | 25 | 75 | 100 |
| Course Title | | TEACHING AND LEARNING SKILLS | | | | | |
| SYLLABUS | | | | | | | |
| Unit | Contents | | | | | | Hours |
| I | Computer Applications Skills Computer system: Characteristics, parts and their functions – Different generations of computer – Operation of computer: switching on/off/restart. Mouse control, Use key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends. Integration of ICT in teaching and learning – ICT applications: *Using word processors*, Spread sheets, Power point slides in the classroom. | | | | | | 12 |
| II | Communication Skills Definitions – Elements of communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication – Spoken and Written; Non-verbal Communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – *Classroom communication and dynamics*. | | | | | | 12 |
| III | Communication Technology Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-Content – Satellite-based communication: Communication through web: Audio and Video applications on the internet, Interpersonal communication through the web. *Browsing Techniques*, Website: Pub-med, Springer Link, Science directs. | | | | | | 12 |
| IV | Pedagogy Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration Itunes with the nature of different disciplines – Lecture with power point presentation – Versatility of Lecture technique – Demonstration: Characteristics, Principles, Planning, *Implementation and Evaluation* – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Modes of teaching: CAI, CMI and WBI. | | | | | | 12 |
| V | Teaching Skills Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set induction, *Skill of Stimulus Variation*, Skill of Explaining, Skill of Probing, Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills. | | | | | | 12 |
| VI | Current Trends (For CIA only) EDUSAT and ETV Channels | | | | | | |

..... Self Study

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| Text Book(s): |
| 1. Kumar, K.L. Educational Technology, New Age International Publishers, New Delhi. 2008. 2. Vanaja, M and Rajasekar, S. Computer Education, Neelkamal Publications, Hyderabad. 2006. |
| Reference Book(s): |
| 1. Mangal, S.K, Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.2002. 2. Michael, D and William. Integrating Technology into Teaching and Learning: Concepts and Applications, prentice Hall, NewYork.2000. 3. Pandey, S.K. Teaching Communication, Commonwealth Publishers, NewDelhi. 2005. 4. Ram Babu, A and Dandapani, S, Microteaching (Vol.1 &2), Neelkammal Publications, Hyderabad, 2006. 5. Singh, V.K and Sudarshan, K.N. Computer Education, Discovery Publishing Company, New York.1996. 6. Sharme, R.A, Fundamentals of Educational Technology, Surya Publications,Meerut.2006. 7. Bela Rani Sharma,. Curriculum Reforms and Teaching Methods, Sarup and sons, NewDelhi.2007. 8. Don Skinner,. Teacher Training, Edinburgh University Press Ltd., Edinburgh 2005. |
| Web Resource(s): |
| 1. www.teachhub.com › ... › Professional Development 2. www.bdu.ac.in › cde › docs › ebooks › B-Ed › LEA 3. www.education.gov.gy › teachers › tips-for-teaching 4. www.edutopia.org › project-based-learning-guide-impo. |

| Course Outcomes | | |
|---|---|----------------------------------|
| Upon successful completion of this course, the student will be able to: | | |
| CO No. | CO Statement | Cognitive Level (K-Level) |
| CO1 | Define and explain the applications of computers and examine ICT and its merits | K1 & K2 |
| CO2 | Administer and teach the communication skills | K3 |
| CO3 | Appraise Teaching skills. | K4 |
| CO4 | Summarize communication technique and browsing techniques | K5 |
| CO5 | Design Pedagogy to improve Teaching Learning 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 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2.5 |
| CO2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2.6 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2.4 |
| CO4 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2.5 |
| CO5 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2.6 |
| Mean Overall Score | | | | | | | | | | | 2.5 |
| Correlation | | | | | | | | | | | Medium |

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

Course Coordinator: Dr. I. Joseph A. Jerald & Dr. M. Aneez Mohamed